RAILROAD GAZETTE

FRIDAY, SEPTEMBER 11, 1896.

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Contributions.

Very Fast Running.

PHILADELPHIA, Pa., Sept. 4, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your issue of Sept. 4, 1896, page 625, comments on West Coast Flyer, you say: "It is faster than any schedules known of in this country," a comment made on the speed of 32½ miles in 32 minutes.

Please note the 4 p. m. schedule to Atlantic City, on the "Reading Royal route to the sea." Camden to Pleasantville, 50.5 miles, in 44 minutes; West Collingwood to Pleasantville, 47.4 miles, in 39 minutes Williamstown Junction to Pleasantville, 33.5 miles, in 27 minutes; Winslow to Pleasantville, 26 miles, in 21 minutes; ranging from 68.86 to 74.44 miles per hour, with trains of eight cars, four coaches and four Pullmans. S. M. V.

[The locomotive which makes this run was illustrated in the *Railroad Gazette* of June 12, 1896. It was built by the Baldwin Locomotive Works for the Central Railroad of New Jersey, and is what is known as the "Atlantic" type. It has four drivers, coupled in the usual manner, and a pair of trailing wheels behind the drivers to carry the fire-box. The total weight of the engine is 142,900 lbs., and the weight on drivers, 78,600 lbs.; the diameter of the drivers is 84½ in. The cylinders are 13 and 22 in. in diameter by 26 in. stroke. The total heating surface is 1,835.1 sq. ft.]

Compressed Air at The Tennessee Centennial Exposition.

[The letter which we publish below from Professor Magruder was in answer to an inquiry in regard to the exhibit of compressed-air machinery at the Tennessee Centennial Exposition, which is to open May 1, 1897. He has been untiring in his efforts to make the department which has been under his immediate control one of the most attractive features of the Exposition.]

NASHVILLE, Tenn., Sept. 4, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The idea of a Compressed-Air Exposition was suggested to the writer by an article in the magazine *Compressed Air*, published by the Ingersoll-Sargeant Company, of 26 Liberty street, New York.

While the writer has mapped out several lines of compressed-air machinery, and has secured several exhibits, he regrets that his removal to Columbus, O., will prevent his crrrying his ideas through, but trusts that they will meet with cordial support by his successor. The number of industries which are now finding that compressed air is a faithful and efficient source of power is increasing very rapidly, over 250 being now on the list.

Going around among shops this summer, the writer was surprised to see how general the use of chipping machines, driven by compressed air had become in foundry, machine and boiler shops, to say nothing of the stone yards, and the testimony of the men who use the machines convinces me that some of the makes have come to stay.

The writer is also of the opinion that compressed air refrigerating can be successfully and economically applied to the cooling and ventilation of buildings during our intensely hot weather, and that the day is not far distant when men of means will no more think of sitting in their offices with the mercury registering 90 deg. to 100 deg. F. without refrigerating machinery than they would think of sitting in the same office in winter time with the thermometer from 10 deg. to 40 deg. F. without heating machinery. This belief may be heresy and the idea may be a "little previous." I have talked it over myself with a number of experts, and we have come to the conclusion that it is more a question of finance than it is of engineering.

We are hoping to have a compressed-air intramural railroad around the Exposition grounds.

W. T. MAGRUDER, *Chief of Machinery.*

A Quarter Century of Progress in Engineering Education.*

BY ROBERT FLETCHER,

Director of the Thayer School of Civil Engineering.

The Historical Background of the Status of 1870.—The "Committee of Civil Engineers" which edited the Reports of Smeaton in 1812 made this observation: "Before or about the year 1760 a new era in all the arts and sciences, learned and polite, commenced in this country (Great Britain). Everything which contributes to the comfort, the beauty and the prosperity of the country moved forward in improvement so rapidly and so obviously as to mark that period with particular distinction." After brief reference to the enormous development of manufactures, internal navigation, harbor works, military and naval establishments, etc., they add: "This general situation and condition of things gave rise to a new profession and order of men called civil engineers."

The era was that of Brindley, the early canal builder; Smeaton, who first bore the title of the new order; Metcalfe, the blind road builder; Rennie and Telford, whose various works covered the kingdom; and Watt and Stephenson, whose mechanical triumphs gave to mankind all the potentialities of the steam engine and locomotive.

And yet it was a tardy awakening. Although Myddleton, a century and a half before, had brought the New River water into London, Drake had given an aqueduct to Plymouth in 1594, and Vermuyden, from Holland, had executed great levees and drainage works, Smiles says: ". . . we depended for our engineering, even more than for our pictures and our music upon foreigners. At a time when Holland had completed its magnificent system of water communications, and when France, Germany, and even Russia had opened up important lines of inland communication, England had not cut a single canal, while our roads were about the worst in Europe."

But, while the profession was rising in England to dignity and honor, there was no organized system of technical education. It was the period of self-taught men. Only in rare cases did early advantages include the university. These men came slowly to professional maturity; they were developed from the conditions and needs of the times; they both made the profession and were made by it. Apprenticeship in the engineer's office was both the school and the road to advancement. Methods were empirical; knowledge of principles imperfect; economic conditions and necessities too much ignored; and the great works—many of them monumental—are not examples for modern imitation. Nevertheless the system has borne magnificent fruit in the vast and enduring—but usually too costly—works, which have been the chief means of establishing and confirming British domination in every quarter of the globe.

What may be termed the first regular school of engineering in England began at late as 1840, in University College, London. The same year saw the chair of civil engineering founded by Queen Victoria in the University of Glasgow, where Rankine did so much for engineering education. The well-known Thomason Engineering College at Roorkee, India, was founded in 1847, and in 1892 there were four engineering colleges in that country. Five years ago official statistics named 41 engineering schools in the entire British empire, nearly half in the colonies; but the greater part of these were properly schools for artisans. In 1876, Capt. Douglas Galton testified that, even then, the successive stages for a civil engineer were: A liberal education at some school or college; regular or apprenticed pupil to a leading engineer; assistant to an engineer; and, finally, independent practice. Only three years ago a noted English engineer, before the world's greatest engineering society, deplored the continued past neglect of abstract science and theoretical training, by the great body of English engineers.

Turning to France we find early recognition of the value of organization in the conduct of public works. The Corps des Ponts et Chaussées was established by law in 1716. The importance of systematic technical instruction was so clearly perceived by Perronet that he is said to have made a beginning for the École des Ponts et Chaussées in 1747, and labored for it until its official recognition by an order of Turgot in 1775. [The magnificent stone bridges and other public works of this distinguished engineer doubtless served as models for the next generation in England.]

The year 1765 saw the beginning of the famous Mining Academy at Freiberg; 1794 of the École Polytechnique at Paris, by act of the National Assembly; 1815 the Polytechnic of Vienna, and 1821 of the Royal Polytechnic Institute of Berlin. These and later schools on the Continent have largely made the profession there, and have exerted a constant dominating influence upon it. The prestige of governmental control and generous support, the high rank of leading professors—not only as teachers, but as investigators, practicians and authors—have, during half a century or more, attracted many American students who, in their turn, have had a large and healthy influence upon the schools and practice in America.

American engineering practically begins with this century, and the United States Military Academy was, from the start, a nursery of civil engineers. Its first graduate in 1802, Gen. Swift, was a distinguished military and civil engineer. During more than half a century about two hundred of its graduates became civil engineers, some of whom achieved the highest distinction, and this not because civil engineering ever had a very large place in the curriculum, but because the rigid military discipline and thorough instruction in mathematical and physical science well equipped its graduates for the exigencies of that period. Thence issued in 1837 the first formal treatise on civil engineering in English. Its honored author, Prof. Mahan, gives a list of works then available to the student, an instructive glimpse of the book-resources of that day.

[This list was: Sganzin's Programme of Civil Constructions at the Polytechnic, Paris; Edinburgh Encyclopedia, articles on bridges, canals and carpentry; Tredgold's Carpentry and Tredgold on Cast-Iron; Transactions of the Society of Civil Engineers; De Pambour on the Locomotive; Wood on Railroads; Storrow on Conveyance of Water; De Gerstner, Chemins Ornière; Freussat on Mortars; and the works of Navier (then an author since 1817).

We must note that Mr. Storrow's work (1835) was probably the first systematic treatise on hydraulics in English. Its author (still living) graduated from Harvard, studied in the French schools, and not long afterward built the works of the Essex Co. at Lawrence.

Prof. D. H. Mahan was himself a graduate of the U. S. Military Academy, a special student in France, for 37 years the head of the department of military and civil engineering at the academy, and the author of no less than six works on military and civil engineering, all of which were widely used as standard for half a century.

We may note also that Davies, Church and Bartlett, distinguished graduates and professors at the military academy, by their admirable treatises on mathematics, mechanics, physics and astronomy, exerted a wide influence in promoting the best technical education throughout the United States.]

Mahan's text-book was so well esteemed that in 1872 15,000 copies had been sold; it was reproduced in quarto form in England, was used in one of the government schools in India, and was translated, in whole or in part, into several foreign languages.

The name of the Rensselaer Polytechnic Institute of Troy is synonymous with engineering education in America. Founded in 1825, nurtured by the wisdom of Amos Eaton, sending out the first *graduate* civil engineers of the English-speaking world in 1835—just at the opening of the railroad era—it has, from its early start, ever maintained the highest standard of effective training in its course for civil engineers. Its gratuates have been in the fore-front of the profession for 50 years.

The Franklin Institute of Philadelphia, through its drawing school and lecture courses, also did a useful work after 1826 in the elementry instruction of engineers as well as of artisans.

But, apart from the schools, as in England, we survey a goodly line of eminent men who owed little or nothing to such aid; men of native ability, whose training was on the works and in the office. However, the results in America were beter than in England. Lack of resources forbade costly experiments. The judicious adaptation of small means to the greatest possible outcome established the true principal of engineering practice. Before 1840, American engineers had already achieved a world-wide fame by the novelty and magnitude of their works. The builders of the early canals and railways soon departed from English precedents, and the famous constructors of timber bridges and promotors of steam navigation set examples for the world, even from the first decade of the century.

In "Stuart's Lives" of twenty well-known American engineers, born between 1731 and 1827, over a quarter were school-trained—three at West Point, one at Yale, and the last, Roebling, at the Royal Polytechnic, Berlin.

The Situation between 1860 *and* 1870.—In 1866 there were in the United States six engineering schools of established reputation, which had graduated during the previous 31 years about 300 students. During the next five years the number increased from 6 to 21, and the total of engineering graduates from 300 to about 850.

The schools had very inadequate resources; engineering laboratories for general instruction were practically unknown; text-books were few and many derived from abroad; instruction was probably more largely by recitation from the book with great emphasis on purely mathematical exposition, according to methods of Navier, D'Aubisson, Morin, Bresse, Moseley, Rankine, etc.; the subjects taught were much the same by name as those taught to-day, but not so many, not so practically developed, and without aids now deemed essential; they were, however, fundamental, and the capable student got a firm grasp of principles.

An important feature of the situation at that time was the general sentiment of the profession toward the schools. This appeared emphatically in the memorable joint discussion of 1876 before the Engineering Societies, provoked by the notable paper of Mr. Holley on "The Inadequate Union of Engineering Science and Art." It was claimed that engineering instruction was almost solely devoted to abstract principles; that it was largely misdirected, because separated from the objects, phenomena and conditions of practice; it was, therefore, ineffective and usually contemned by the practicians; the spheres of the investigators, school men and men of engineering affairs were too wide apart and their labors not correlated; the young graduate was said to be nearly useless even as a conservator; a change was demanded which would result in a better adaptation of means to ends and make the graduate more immediately available.

Never before had activity in all construction been so

*Abstract of paper read before the Society for the Promotion of Engineering Education, Buffalo, N. Y., August, 1896.

widespread. Railroads, bridges, waterworks, sewerage-works and mining and metallurgical plants were demanded over the face of the continent. Hundreds were crowding or were being pressed into service with little or no proper education. Chainmen and axmen speedily became transitmen and "engineers." To such practicians the defects of the schools were more obvious than their own deficiencies. Yet the value of technical training began to be realized by some who had only crude ideas as to what it should be. Those who believed in giving first place to theoretical instruction could point to examples of noted engineers both at home and abroad. But the field was widening; new materials and forms of construction were coming into use; new experimental data were needed; hence the proper scope for an engineering course was rapidly enlarging, and there was good reason for the demand that the schools keep in better touch with the profession.

THE PAST QUARTER CENTURY OF ENGINEERING EDUCATION.

Progress Appears by Contrasts.—A special committee of this society reported last year 109 institutions rated as engineering "colleges" or schools, including all grades. This is a five-fold increase since 1871 and is certainly excessive. In 1892 the total of graduates from 52 engineering schools was about 9,000. Of these, 5,400 from 45 schools were rated as civil engineers; about 2,800 from 33 schools as mechanical engineers; about 870 from 15 schools as mining engineers; and more than 200 from 20 schools, within the previous two years only, as electrical engineers. This differentiation dates from about 1867 for mining schools, from 1870 for schools of mechanical engineering and from 1885 for courses in electrical engineering. Within the colleges we find notable expansion into other special courses denominated railroad engineering, hydraulic engineering, sanitary engineering, chemical engineering, etc.

A quarter of a century ago student work in the laboratory was just initiated by an American professor and scientist for the study of chemistry and physics. Now we are in an age of laboratories. Not only are they provided for testing all important properties of materials on the largest scale, for hydraulic tests and verifications, and for metallurgical studies, but a recent writer has said that a mere list of the subjects for which there exist well-equipped special laboratories would astonish even the most well informed man. What is now deemed adequate instruction for the would-be mechanical and electrical engineer becomes impossible without at least a moderate provision of standard machines and measuring appliances. Although it is a fact that the magnificent library and museums of ancient Alexandria had auxiliary laboratories for researches in anatomy and physiology, the modern application for instruction is hardly older than the present generation.

But progress measured only by quantity, and objectively, may be more apparent than real. Schools, with their appliances, are but means to an end. From the concrete and visible we must look for an invisible or spiritual result, which, like energy, is measured solely by the effect produced. Hindering conditions must be recognized. Doubtless there are to-day too many schools and too many students; doubtless standards of admission are too low, and consequently too many studies are forced upon immature and half-trained mental capacity; doubtless some are beginning too early, without the needed foundation of general culture, and then turning with undue haste into some specialty. Doubtless there have been cases of misdirected private munificence in the starting of new institutions, instead of strengthening the old and well-tried; doubtless one-half the present number of schools with the same total of resources might meet more effectively all real demands; yet each has its own valued legitimate field.

This society, which is now widely recognized as a power for promoting technical education, has responsibilities. Our former Secretary has truly said that "the task which it has set itself to perform is nothing less than shaping the future of technical education, not only in America, but by example in all the world." The body of the profession may well call upon it to define "engineering education," to formulate and uphold a high standard, to recognize admissible limitations, and to propound not an impossible but a practicable ideal.

The Influence of Technical Education Upon the Older and Traditional Learning—We need only to allude to the profound changes in the courses of study of all our leading colleges and universities. Out of this quasi-revolution has come the elective system, not as a mere expedient, but as a proper enlargement of the function of the college. However, this must carry with it a corresponding development of the power of the student to make intelligent choice. The distinguished President of one of our oldest and most wisely conservative colleges has said:

"It is always and everywhere the function of the college to give a liberal education, beyond which and out of which the process of specialization may go on in any direction and to any extent. The college must continually adjust itself to make proper connection with every kind of specialized work, not to do it."

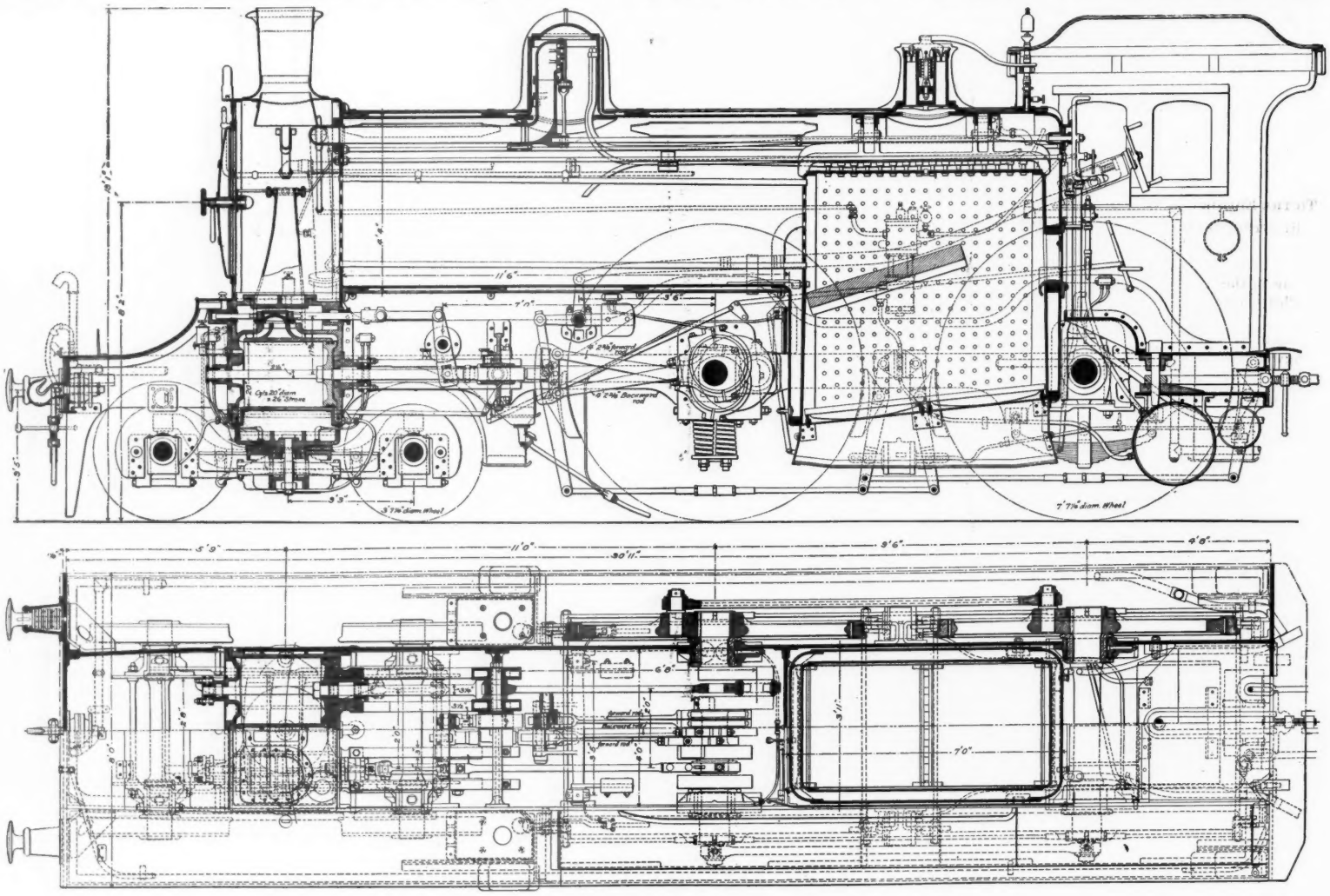
Quoting Virchow, who claims that "mathematics, philosophy and the natural sciences give the young minds so firm an intellectual preparation that they can easily make themselves at home in any department of learning," he adds: "With few exceptions, the greater scientists among us are taking their place in literature. They are recovering the original qualities of style, simplicity, clearness, vividness. Some of them have caught with remarkably close ear the accents of the English tongue."

Finally, under this head, we know how many observers have called attention to the *strenousness of endeavor* exhibited by students in the engineering schools, and the greater effectiveness of the instruction, because the practical and fruitful ends in view offer more direct and therefore more sufficient incentive.

Progress is evident also in the inevitable *reaction of the schools upon the profession.* In the ranks of the profession the school graduates have passed fram a hopeless minority to an influential majority. With a few brilliant exceptions, the great achievements in American engineering in the past 25 years have been wrought by men who owed much to a broad education or a a technical training, or both. Conspicuous failures of important undertakings and of minor works all over the land mark the course of some "practical" men who have gloried in their lack of technical education. Some of the very best treatises in the ever-widening range of special departments have come from the schools. The schools have given the profession important results of special researches, especially on properties of materials, although such work is not a necessary function of the school. The graphical statics, that powerful and time-saving method of analysis and computation, is a gift from the school-men to the practicians, which was too long not half appreciated.

A corresponding *counteraction of the profession upon the schools* is seen in the large recruitment of the force of teachers from the ranks of practicing engineers; in the cordial co operation of the practicians and managers of works, by which students are given free access to every variety of plant and construction; in the present availability of the *Transactions* of engineering societies and the current issues of the technical engineering journals (for we must remember that there was almost nothing of that kind published in America 30 years ago). We may allude, also, to the array of manuals, field books, special treatises and descriptive albums prepared by leading engineers, and embodying results of latest experience and research, not only for the profession at large but often especially for the use of students.

In this connection we are forced to notice the unfavorable bearing of the excess of schools and graduates upon the relation between the schools and the profession. The superfluous graduate is in danger of becoming an unwelcome intruder—a disturber of equilibrium—treading upon the heels of his senior, often crowding aside the more experienced and more competent man and lowering the rate of compensation, especially in the middle ranks. And yet Telford, in 1830, before either England or America had seen a graduate engineer, complained that the profession was overstocked, and tried to dissuade young men from entering it. Also at the Philadelphia conference in 1876, older engineers declared that engineering was then overdone. In 1892 investigation showed that out of 3,540 graduates of engineering schools, 59 per cent. were strictly in engineering pursuits, 7 per cent. were railroad officers, 7 per cent. managers of works, 2 per cent. contractors, and 25 per cent. in other occupations. At the same time the membership of the



New Express Locomotives for the North Eastern Railway, England.

Designed by Mr. WILSON WORSDELL, *Locomotive Superintendent.*

American Society of Civil Engineers showed only 56 per cent. in strictly full practice, 21 per cent. in related pursuits, and 23 per cent. not specified, but mostly not practising or in some other business. However unfavorable we may interpret these figures as showing an excess of supply, and a crowding out of a rather large percentage from regular practice, they illustrate the well-known distinctive advantage of this profession—that both the school-training and the professional experience qualify men for a variety of other pursuits.

First, Quality Rather than Quantity.—The profession doubtless demands of the school that it shall at least restrict overproduction by high standards of admission, by excluding all inferior capacity and by strict requirements of aptitude and high proficiency.

Second. Although the scope of the curriculum is now so greatly enlarged, the proper work of the school must ever be upon the foundations; upon those controlling principles, data, methods, manual operations, verifications and the common business transactions of engineering which underlie and sustain the broad superstructure of professional activity.

Third. The student should be made familiar with the best professional literature and all important sources of information; he must know how to make his knowledge and elementary skill effective in emergencies. For, after all the school can do, the man must advance himself.

Finally. The school must give the man inspiration from the history, traditions, achievements and noble personalities of the profession, both past and present. By this means, and through the personal influence and example of his instructors, the student should grow into strength of character, firm integrity and that high sense of professional honor which, amidstall temptations, will ever hold duty and truth far above any price.

The New Express Engines of the North Eastern Railway, England.

We illustrate this week the fine new engines which Mr. Wilson Worsdell, the Locomotive Superintendent of the North Eastern Railway Company, has designed and built at Gateshead for working the ever-increasing fast and heavy traffic over the northeastern portion of the East Coast Joint Stock Railway—York to Edinburgh. These engines have not been sufficiently long at work to give data of their performance, but, from what they have done, little doubt is left that they will amply maintain the high opinion that has been formed of them.

We are indebted to Mr. Wilson Worsdell for the drawings from which our illustrations have been made, and the list of dimensions given below.

It will be noticed that the cylinders are 20 in. in diameter with a stroke of 26 in. The driving wheels are 7 ft. 7¼ in. in diameter, coupled, and the centers are 9 ft. 6 in. apart. The leading end of the engine is carried on a four-wheeled bogie truck, which ensures safety in taking curves and passing over points. The engines at very high speeds ride remarkably steady and pass round sharp curves with great freedom. Notwithstanding their great size they are very light in weight, and easy on the permanent way. At some future time we hope to give an account of the working of these engines. The table which follows gives weights and dimensions:

NORTH EASTERN RAILWAY, EXPRESS PASSENGER ENGINE, CLASS Q, 1.

Cylinders.

	Ft.	In.
Diameter of cylinders	1	8
Stroke of piston	2	2
Length of ports	1	3
Width of steam ports	..	2
Width of exhaust ports	..	4
Distance apart of cylinders, center to center	2	..
Distance from center line of cylinder to valve face	1	3¾
Distance between centers of valve spindles	2	..
Lap of valve	..	1⅛
Maximum travel of valve	..	4⅝
Lead of slide valve	..	⅛
Link motion	Stephenson's	
Diameter of piston rod	..	3¼
Length of slide block	1	3
Length of connecting rod between centers	6	8

Wheels and Axles.

	Ft.	In.
Diameter of driving wheel	7	7¼
" " trailing "	7	7¼
" " bogie "	3	7¼
Thickness of all tires on tread	..	3
Width of all tires on tread	..	5½
Distance between center of bogie and center of driving wheel	11	..
Centers of bogie wheels	6	6
Center of driving wheels to center of trailing wheels	9	6
Distance from center of driving wheels to front of firebox	1	10¾
Distance from center of bogie to front buffer plate	5	9
Distance from center of trailing wheels to back buffer plate	4	8

Crank Axle.

Material	Steel
	Ft. In.
Diameter of wheel seat	.. 9
" " bearings	.. 8
" at center	.. 7¾
Distance between centers of bearings	3 10
Length of wheel seat	.. 7⅞
Length of bearing	.. 9

Trailing Axle.

Material	Steel
	Ft. In.
Diameter at wheel seat	.. 9
" " bearings	.. 8
" " center	.. 7¾
Length of wheel seat	.. 7⅞
" " bearings	.. 9
Distance between centers of bearings	3 10

Bogie Axle.

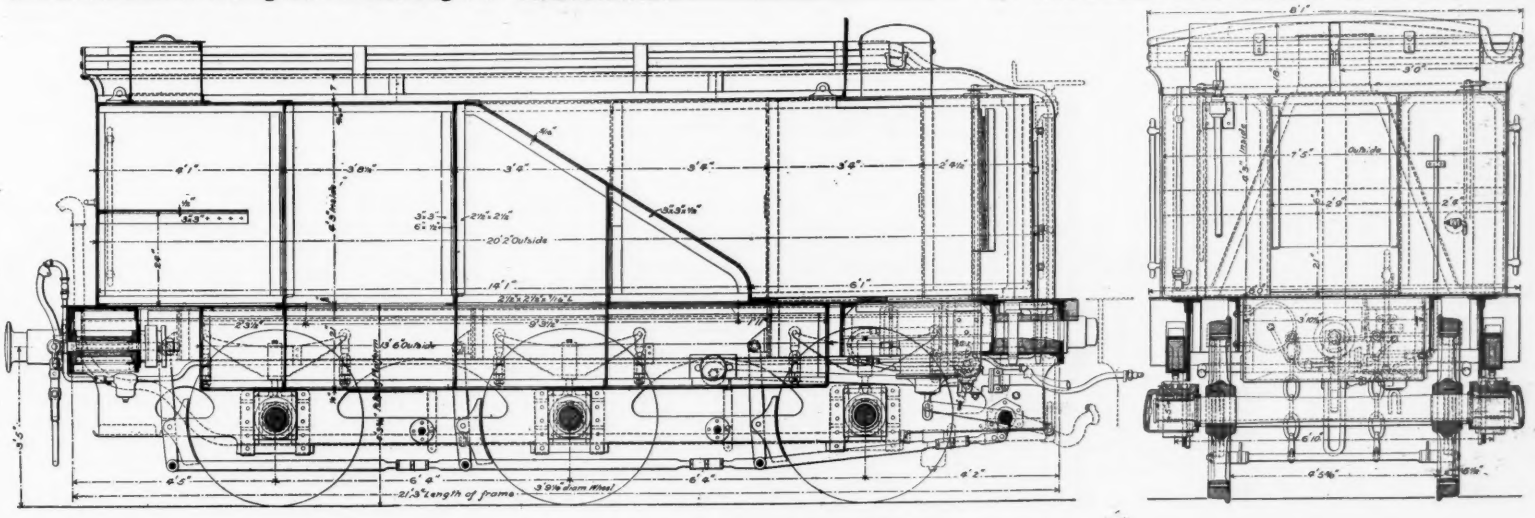
Material	Steel
	Ft. In.
Diameter at wheel seat	.. 7½
" " bearings	.. 6
" " center	.. 5¾
Length of wheel seat	.. 7¼
" " bearing	.. 9
Distance between centers of bearings	3 7
Diameter of crank pins	.. 3¾
Length of bearing	.. 4⅛
Throw of outside crank	1 ..

Frames.

Material	Steel
	Ft. In.
Distance between frames	4 0
Thickness of frame	.. 1
Distance between bogie frame	2 8
Thickness of frame	.. ¾

Boiler.

Material	Steel
	Ft. In.
Center of boiler from rail	8 2
Length of barrel	11 6
Diameter of boiler outside	4 4
Thickness of plates	.. 11/16
Thickness of smokebox tube plate	.. ¾
Butt joint	.. 5½
Pitch of rivets	.. 2
Diameter of rivets	.. ⅞



Tender for the North Eastern Express Locomotive.

Fire-box Shell.

Material	Steel.
	Ft. In.
Length outside	7 0
Breadth outside at bottom	3 11
Depth below center line of boiler at front end	5 8
" " " " back end	5 0⅛
Thickness of front plate	.. 5/8
" " back plate	.. 5/8
" " sides and top plate	.. 5/8
Distance of copper stays apart	.. 4
Diameter of copper stays	.. 1

Inside Firebox.

Material	Copper
	Ft. In.
Length at the bottom inside	6 3½
Breadth " " "	3 2¾
From top of box to inside of shell	1 5
Depth of box inside at front	6 4½
" " " " back	5 9

Tubes.

Material	Brass
Number of tubes	201
	Ft. In.
Length of tubes between tube plates	11 10½
Diameter outside	.. 1¾
Thickness No. 11 and 13 W. G.	.. ..
Diameter of exhaust pipe nozzle	.. 4¾
Height of chimney from rail	13 1
Total heating surface	1,300 sq. ft.
Grate area	21 " "

Weight of Engine in Working Order.

On bogie wheels	36,736 lbs.
On driving wheels	41,988 "
On trailing wheels	35,268 "
Total	113,992 lbs.

Weight of Tender in Working Order.

On front wheels	30,016 lbs.
On middle wheels	26,880 "
On hind wheels	31,581 "
Total	88,480 lbs.

Tender carries five tons of coal and 4,000 gals. of water. The tender is also fitted with a "scoop" so as to refill when half the journey is over, as many of the trains run through from Newcastle to Edinburgh, and vice versa, without stopping, a distance of 124½ miles.

GENERAL DIMENSIONS OF TENDER.

Wheel Base.

	Ft.	In.
From front buffer beam to center of leading wheels	4	2
From center of leading wheels to center of middle wheels	6	4
From center of middle wheels to center of trailing wheels	6	4
From center of trailing wheels to back buffer beam	4	5

Wheels.

	Ft.	In.
Diameter of wheels on tread	3	9¼
Thickness of tires	..	3

Axles.

	Ft.	In.
Diameter of bearings	..	5
Length of bearings	..	10
Diameter of wheel seats	..	6¾
Length of wheel seats	..	7½
Distance between centers of bearings	6	10

Frames.

	Ft.	In.
Distance between inside frames	4	1
Thickness of inside frames	..	¼
Distance between outside frames	6	2¾
Thickness of outside frames	..	¾
Capacity of tank	3,910 gals.	
Coal space	5 tons	

The above dimensions of tender are for single driver and coupled engines.

Maine Railroad Commissioners Refuse an Electric Railroad Application.

The Railroad Commissioners of Maine, Joseph B. Peaks, Benjamin F. Chadbourne and Frederic Danforth, after a hearing, have refused to grant a certificate that public convenience requires an electric railroad on the highway between Westbrook and Gorham. The application was made by the Portland Extension Railroad Company and it was argued that, the language of the statute being general, the interpretation of it by the Commissioners should be liberal. The petition was opposed by the Portland & Rochester Railroad, whose track would be paralleled by the proposed new line.

The Commissioners, after stating the preliminary facts, quote the language of the statutes covering cases of this kind, pointing out that an applicant must affirmatively show that the public convenience requires the proposed road and that persons opposed to it are not obliged to prove a negative. The desired privilege is not a common right, but is granted by the state only on compliance with the law regulating the matter; and the law requires the Commissioners to find that the public convenience requires the railroad; they cannot use their own discretion as to the best probable policy in the matter. Continuing, the report of the Commissioners says:

The history of the public statutes of this state in relation to the construction of railroads, under the general law, will be a very useful and interesting study to those people who seem to have come to the erroneous conclusion that the Railroad Commissioners have something which they can give or withhold at their pleasure. And a careful study of these statutes will satisfy any candid person that, on the contrary, the Railroad Commissioners have duties and powers which are circumscribed with certain well-defined limits.

Chapter 120 of the P. L. of 1876 was the first act to authorize the formation of railroad corporations, under the general law; before that statute any person or persons who desired to construct a railroad had first to obtain an act of incorporation, or charter therefor, from the Legislature.

By that act of 1876, chapter 120, provision was made for articles of association, under the general law, by certain proceedings before the Board of Railroad Commissioners. And it was further provided that every corporation, before commencing the construction of its road, shall present a petition for approval of location to the Board of Railroad Commissioners, and if the Board of Railroad Commissioners shall approve said location, "and find that public convenience requires the construction of such railroad," the corporation might then proceed with such construction.

The very next year, by chapter 190 of the P. L. of 1877, the Legislature of this state, recognizing the fact that under the statute corporations might be organized and railroads located and constructed parallel to, and competing with railroads already built, and recognizing also that it was the duty of the state to protect roads already constructed, amended the general railroad law by providing that "No railroad shall be located and built under this act running in the same general direction of any other railroad already built or in process of construction within ten miles of such other railroad, without special permission of the Legislature therefore first obtained."

So that by the law as it then stood, while it gave the Railroad Commissioners authority to authorize the

building of a railroad, under the general law, they are prohibited from allowing such railroad to be constructed parallel to a railroad already built, within ten miles. This statute remained until it was repealed by chapter 192 of the P. L. of 1893; so that for six years after the general railroad law went into effect, the Railroad Commissioners were absolutely prohibited from granting a location for a railroad running parallel to another road already constructed.

In the repeal of this act of 1877, the Legislature, no doubt, acted upon the policy of substituting the judgment of the Railroad Commissioners in each case of a proposed railroad, for the arbitrary statute which prohibited the building of a railroad, whatever the public convenience which might require it. For upon the repeal of this latter act, the original statute was left in force; and the Board of Railroad Commissioners in each case was then, as now, to ascertain judicially whether public convenience required the building of such railroad.

Until 1893 there was no statute authorizing the construction of an electric street railway under the general law. By P. L. of 1893, chapter 268, any number of persons, not less than five, a majority of whom are citizens of Maine, were authorized to form a corporation and build an electric street railway. The Railroad Commissioners were directed by statute to approve the articles of association, when sections one and two had been complied with, and upon filing with the Board of Railroad Commissioners a petition for approval of location, approved by the municipal officers of the city or town, as to streets and ways, the Board of Railroad Commissioners were again directed to approve such location. Nothing in that act gave the Railroad Commissioners any authority whatever to exercise their discretion or judgment. Their duty was simply ministerial.

Two years later, however, by P. L. 1895, chapter 84, a change was made by the Legislature, and the authority was delegated to the Board of Railroad Commissioners to determine, upon petition for location, and notice and hearing thereon, whether public convenience required the building of such electric railway. We have no occasion to inquire why this change was made, only so far as it may inform us as to the meaning of the language used. The language of the act in this respect is now identical with the act which authorizes the building of steam railroads, under the general law: "When the Railroad Commissioners find that public convenience requires it." And it seems very certain that the intention of the Legislature in making this change was to have the law authorizing the construction of steam railroads, and that authorizing the construction of electric street railways, conform as nearly as possible. In fact, the two statutes are now almost identical in their operation; and this intention of the Legislature is emphasized by the fact that section 10 of the act authorizing street railways provides that "So far as practicable, the provisions of sections 17, 19, 20, 22, 23, 24, 25, 26, 27, 36, 37, 38, 39, 54, 56, 57, 66, 68, 114, 115, 116, 117, 118 and 126 of chapter 51 of the Revised Statutes shall apply to street railways." These several sections in chapter 51 are all in relation to the organization and construction of steam railroads.

Our former decision of this same subject matter, we thought, clearly enough expressed our views, but as the matter is again before us we have thought it best to ascertain what has been the opinion of other courts upon this question. We have had presented to us petitions, said to represent more than 700 citizens of Gorham and Westbrook, alleging that public convenience requires the building of this electric railway. In a recent case before the Supreme Court in the state of New York, where the facts are so nearly like the facts in this case that one almost wonders at the similarity, Herrick, J., in an opinion of the court uses this language: "Some of the petitioners certify that public convenience and necessity require the construction of the proposed road, and others certify that public convenience and necessity do not require its construction. Petitions presenting no facts, nor the evidence thereof, but simply expressing the opinions and desires of the petitioners, are not evidence, and cannot take the place of evidence."

And so we feel that we are not authorized either legally or morally to be influenced by a public sentiment, however much we may respect that public sentiment. For a public sentiment, aroused by local pride, however commendable it may be, is not legal evidence of a public convenience which requires the building of a street railway. As we have stated in our former decision, the Portland & Rochester Railroad now runs six passenger trains each way, daily, between Gorham and Portland, and the gross receipts from transportation between these two points averages only two dollars and two one-thousandths of a cent per train.

The Supreme Court of New York also says: "Where there is no railroad in existence in a locality, or where the traffic is so great as not to be properly cared for by one road, or even where there is traffic sufficient to adequately support more than one road, we may say that public convenience and necessity require the construction of another. But where, as in this case, it appears that existing roads are abundantly able to transact all the business offered, or likely to be offered for many years to come, we do not see how it can be said that public convenience and necessity require the construction of another."

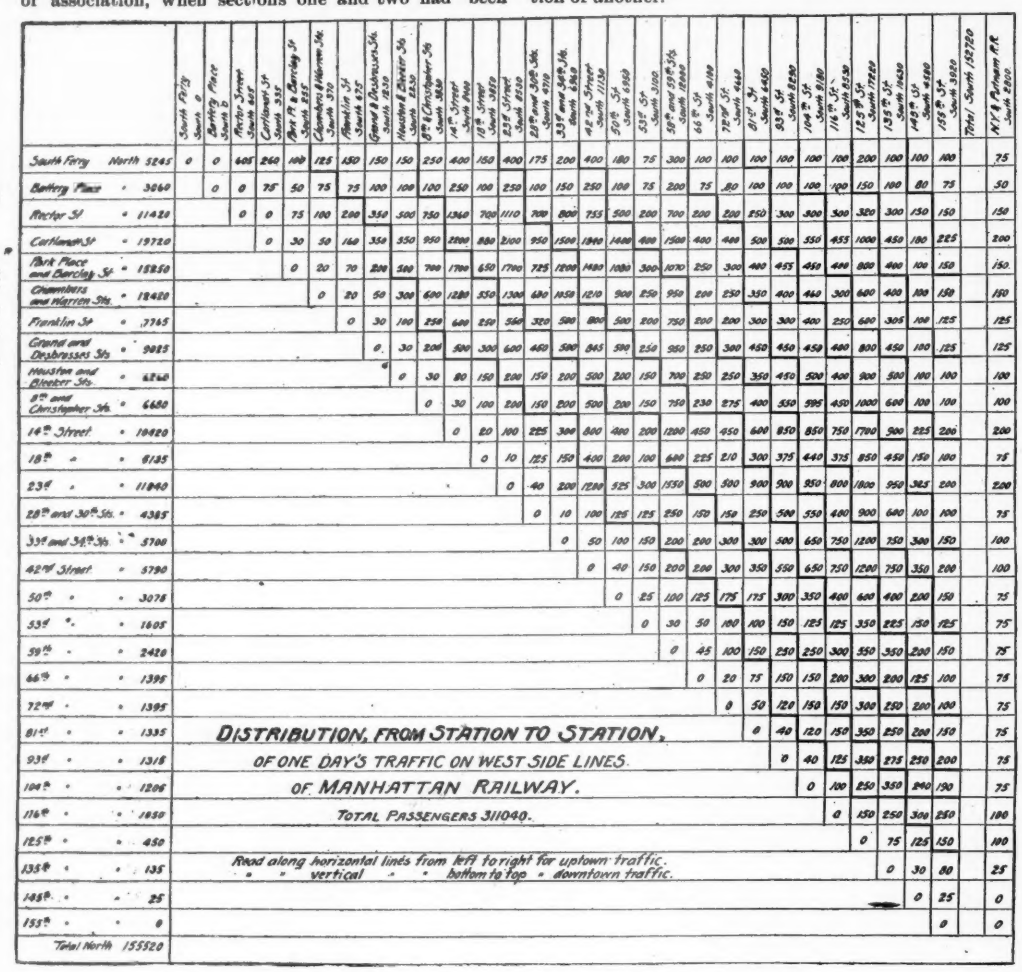

DISTRIBUTION, FROM STATION TO STATION,
OF ONE DAY'S TRAFFIC ON WEST SIDE LINES
OF MANHATTAN RAILWAY.
TOTAL PASSENGERS 311040.
Road along horizontal lines from left to right for uptown traffic.
" " vertical " " bottom to top " downtown traffic.

Diagram No. 1.—A Study of Traffic on the Manhattan Elevated.

The Superior Court of the State of Connecticut, which has jurisdiction to ascertain whether public convenience and necessity require the construction of electric railways, in a decision recently made, uses the following language:

"Upon the question of the convenience and necessity of the Hartford Extension, I find that while many of the people of New Britain would to some extent be accommodated and benefited by the construction of this road, that the intermediate travel between New Britain and Hartford would be light, and not sufficient to furnish any considerable support to such street railway." . . . "I find that the main purpose of such road is the through passenger traffic between New Britain and Hartford; and that in this respect it would be in direct competition with the New York & New England Railroad, and with the New York, New Haven & Hartford. It would be a convenience to many of the people of New Britain to have such a street railway pass their residences and places of business at points nearer than the depot of the steam railroads, and to be able to reach Hartford by cars running at other hours than those of the two railroads. Yet, notwithstanding these facts I think that the two steam railroads running between New Britain and Hartford furnish such facilities for travel between these two points as are reasonably convenient and necessary for the public, and that under the circumstances there is no such public demand for additional means of communication as to require that the public highways between these two cities should be used for the purpose of an electric railway."

This language of the Connecticut court so completely states our views in relation to the few people between Gorham and Westbrook to be accommodated by this proposed electric road, and the present railroad facilities between Gorham and Westbrook and Portland, that we adopt it entire, with the necessary changes as to names.

We are aware that the Supreme Court of this state has held that the laying down of rails in the street and the running of street cars over them is not a new use of the street, but only a later mode of using the street; and that such use is not a new servitude. Such has been the decision of nearly all the courts of the country. But an examination of cases indicates that the rule is only to be applied in the streets of cities and villages where the growth of population along the line of such railway is such as to make it necessary. But where the object of the street railway is to transport passengers along a country road from one city to another, or from one village to another, there seems to be no reason for the rule, and we do not understand our court as having gone to that extent.

And the Supreme Court of Pennsylvania has in several recent cases drawn this new distinction; holding that an electric railway is not an additional servitude in a city street where the municipal authorities have full possession of the entire street for purposes of public travel. Yet in country roads where the public has merely a right of passage, an electric railway is an additional servitude, for which the owners of the land underneath the highway may obtain damages, or in default thereof, may enjoin the construction of the railway.* The court in these cases has dwelt with some emphasis upon the distinction between an electric railway wholly within the limits of one municipality and one which extends from town to town, and is intended for long distance transportation.

The Connecticut case above referred to seems to have been decided somewhat upon this later view of the law, and we find the same principle stated as authority in the new but very interesting work of Mr. Crosswell upon the law relating to electricity, under the title "Eminent Domain."

It may not be out of place in this decision to quote from the admirable message of ex-Governor Dingley to the Legislature in 1874, in which he says: "The Board of Railroad Commissioners must, from the growing importance of railroads, be charged with as high and delicate duties, within the sphere in which they act, as are imposed even upon courts of justice." This era of the great importance of railroads in this State, so clearly predicted by Gov. Dingley, has arrived; and the Board of Railroad Commissioners fully realize the high and delicate duties with which the Board is charged. Our duty will be done when we patiently, carefully, and with what ability we possess, give to every matter submitted to us, our honest judgment, without fear or favor. We have endeavored to so act in this matter. We find ourselves confronted on the one side by a desire to please a community of friends whom we respect, and on the other side by the statutes of the state, by which we must be governed. And after a full consideration of all the evidence and of the decisions of the courts of other states bearing upon the question at issue, we can find no reason why we should change the decision we have once made.

We therefore do not approve the proposed location, because we find that public convenience does not require the construction of said electric railway.

Rapid Transit—Analysis of One Day's Traffic of the Manhattan Railway, New York City.

BY THEODORE COOPER, C. E.

In discussing the important subject of rapid transit for the city of New York, we have been largely dependent upon the published statistics of travel over the various lines of transportation. All the passenger lines, excepting ferry lines, make yearly returns, and occasionally the Manhattan Railway has published the records of one day's travel over its several branches. Of recent years, due to the consolidation of the street-car lines, notably the Metropolitan, the travel on the several avenues or on the cross-town lines cannot be separated. Why the important lines of traffic over the numerous ferries are exempt from reporting their passenger and other traffic is an anomaly, considering the stringent requirements enforced upon all other lines of transportation.

While the general statistics of travel upon the Island of Manhattan have been of great value in all discussions of the subject of rapid transit, the most important part of the problem has necessarily been left to the imagination, viz.: where do these masses come from and go to? Vaguely it is assumed that they come from the upper parts of the island and Westchester, and want to go to the lower end of the island, the pitiful condition of the outlying districts being especially emphasized by those interested in real estate.

In hopes to get some more definite idea as to the distribution of the travel up and down the island than can be obtained by any one person or set of persons, depending solely upon their personal judgments, the writer has endeavored to analyze the traffic of one day over the lines of the Manhattan Railway. The record to be used is the statistics furnished the Rapid Transit Commission as a typical day's work of this system.

These statistics give the sale of tickets at each station on the system for 24 hours. Where there are separate stations for the up and down traffic, they are given accordingly, but where the station is an island station, common to the traffic in both directions, the sales are credited to the direction of the greater traffic. For instance, Hanover Square, Fulton Street, Franklin Square and Chatham Square stations on the East Side are all credited to the uptown traffic of the Third Avenue line. Joint stations for the two lines, either east or west, are either credited to one line or else arbitrarily divided between the two lines. The general summary of this day's travel is as follows:

On Dec. 10, 1894, the Manhattan Railway carried in 24 hours 658,347 passengers, which are credited as follows:

Sixth Ave., North	101,930	South	143,350	Total	245,280
Ninth "	"	37,846	"	23,310	"	60,156
Third "	"	116,366	"	121,370	"	237,736
Second "	"	33,597	"	52,823	"	86,420
Suburban						28,756
Total "	"	289,739	"	359,853	"	658,34

According to the above summary there are 50,114 more passengers going down the four avenues than go up the same.

This difference is not peculiar to this day's travel, but is usual. Mr. H. G. Prout (*Railroad Gazette*, Nov. 20, 1891) found from the records for Nov. 2, 1891, a downtown excess of 68,112 in a total of 703,782. It cannot be explained by the island stations being credited to one

* Pa. R. R. Co. vs. Montgomery Co. Pass. Ry. Co., 31 Atl. Rep., 468.
Thomas vs. Inter. Co. St. Ry. Co., 31 Atl. Rep., 476.
Rahn Township vs. Tamaqua & L. St. Ry. Co., 31 Atl. Rep., 472.

direction only, for the most important of these are down town, and any corrections would tend to increase rather than diminish the down traffic. So great a preponderance in one direction cannot be true, as far as the actual traffic is concerned, but may be so by the record of the ticket sales.

There are three methods of explanation, all of which may be operative in producing this difference in the traffic.

1st. The passengers who go around South Ferry from the west to the east line or reverse would in each case buy a down ticket. So that for one round trip he would be credited with two down tickets. As this regu-

	Rector Street	Cortlandt "	Park Place	Chambers Street	14th " Street	23d "	42d "	59th "	81st "	104th "	125th "	155th "	N.Y. & Putnam R.R.	
Rector Street		0	75	100	1300	1110	755	700	250	300	320	150	150	5270
Cortlandt "			30	50	2200	2100	1900	1500	500	550	1000	225	200	10195
Park Place				20	1700	1700	1400	1170	400	450	800	150	150	7920
Chambers Street				0	1280	1300	1210	950	350	440	600	150	150	6450
14th Street						100	900	1200	600	850	1700	200	200	5650
23d "							1800	1550	900	950	1800	200	200	6800
42d "								500	350	650	1200	200	100	2700
59th "									150	250	550	150	75	1175
81st "										120	350	150	75	695
104th "											250	100	75	515
125th "												150	100	250
155th "												0	0	0
												Total		47430

Diagram No. 3.—Travelers Each Way between Selected Stations.

lation of transfer for one fare, only went into operation in November, 1894, it cannot be of much effect upon the statistics under consideration.

2d. The preference of business men to make stops in the morning or down-town trip rather than on their way home.

3d. And undoubtedly the greater reason, the purchase of two or more tickets at their home station by shoppers and others.

For all practical purposes we can assume that the general traffic up and down the various lines is a balanced one, that is, the same number of people who depart from a station return thereto.

As the traffic records of the Sixth and Ninth avenues are more nearly correct than those of the East Side, owing to the presence of only one station (116th street), where the traffic cannot be positively separated to the up and down directions, we shall use the data of these lines in our further inquiry.

Moreover, as all the stations below Rector and above Fifty-eighth street are joint stations for both the Sixth and Ninth Avenue lines, we will treat the two lines as a single line, combining the stations on the two lines opposite each other. This method will also provide for such passengers as take one line in one direction and return by the express trains on the other. As our purpose is to determine the distribution up and down the island this combination simplifies the solution, without vitiating the result.

Correcting the traffic credited to the 116th street station relatively to the proportions shown for up and down traffic at 104th and 125th streets, we find that there are 24,124 more tickets sold on the down-town side than on the up-town side, or 12,062 more people have bought return tickets on that side than on the other. In order to obtain a perfectly balanced traffic, we must distribute these 12,062 over all the stations proportionately.

In addition to the 305,440 passengers credited to the Sixth and Ninth Avenue lines from their station reports, there are 2,800 passengers (determined by the average ticket sales to the New York & Putnam Railroad) received at the 155th street station from the Yonkers line. These have been distributed to the various stations as shown in the last vertical column of diagram No. 1. After adjusting the data in this manner we obtain the following as the probable station traffic of the Sixth and Ninth Avenue lines.

Dec. 10, 1894. Total passengers, 311,040.

Station.	Passengers North.	Passengers South.
South Ferry	5,245	0,000
Battery Place	3,060	0,000
Rector	11,420	605
Cortlandt	19,720	335
Barclay and Park Place	15,250	255
Chambers and Warren	12,420	370
Franklin	7,765	675
Grand and Desbrosses	9,025	1,230
Houston and Bleecker	6,260	2,230
8th and Christopher	6,680	3,830
14th	10,420	8,400
18th	5,135	3,850
23d	11,840	8,530
28th and 30th	4,385	4,710
33d and 34th	5,700	6,960
42d	3,[illegible]	11,130
50th	3,075	6,950
53d	1,605	3,100
58th and 59th	2,420	12,000
66th	1,395	4,160
72d	1,395	4,660
81st	1,335	6,450
93d	1,315	8,290
104th	1,205	9,180
116th	1,050	8,530
125th	450	17,220
135th	135	10,630
145th	25	4,580
155th	0	3,920
N. Y. & Putnam R. R.	.....	2,800
Total	155,520 North.	155,520 South.

With the above distribution at stations of a balanced traffic, we can by means of diagram No. 1 distribute the passengers from each station to the other stations. If we take the number of passengers going north from South Ferry and apportion them to each station above, along the top horizontal line of the diagram according to our best judgment, and proceed similarly for all the stations, we get a first approximation of the distribution.

The numbers in each vertical column must be, according to the assumption of a balanced traffic, not only the numbers who arrive at that particular station, but also the numbers leaving that station for down-town. So the numbers in the vertical columns should represent the down-town traffic from each station, and must sum up to that amount. It becomes necessary, then, to adjust our first selected numbers so that the horizontal lines sum up the total up-town traffic from each station, and the vertical lines the total down-town traffic from each station. After the laborious work of reaching this perfect balance is completed, we may consider that the diagram gives a close approximation to the actual distribution of the daily traffic. It is not claimed to be an exact diagram, but one close enough for getting more definite ideas of the subject than mere guess work or assumptions without any basis of actual facts. Innumerable diagrams which would balance can be obtained, but if judiciously made they will not vary sufficiently to change the deductions.

The heavy lines on the diagram mark approximately mile distances from the starting station, up and down the island. By these we find that

		less than
8,570	people travel each way,	1 mile
24,530	" " " "	2 " and more than 1 mile
33,980	" " " "	3 " 2 "
29,595	" " " "	4 " 3 "
20,310	" " " "	5 " 4 "
16,560	" " " "	6 " 5 "
10,210	" " " "	7 " 6 "
7,120	" " " "	8 " 7 "
3,130	" " " "	9 " 8 "
1,505	" " " "	10 " 9 "
155,520		

We also find the average travel on these lines to be 3.4 miles. The center of gravity of the up traffic is about Seventy-second street, and for the down traffic about Bleecker street. The center of gravity of the station traffic is about Forty-second street. For the East Side lines, south of the Harlem River, the center of gravity of the station traffic is about Forty-second street. If we include the Suburban branch, north of the Harlem River, the center of gravity is between Fiftieth and Fifty-ninth streets.

We are not able to make a diagram of the East Side traffic that will be as near correct as the one given above for the West Side, owing to the impossibility of properly separating the up and down traffic at the island stations, which include all the stations from Chatham Square to South Ferry and all of the Suburban branch.

For our own instruction, we have made such a diagram covering the whole Manhattan system and it indicates that the diagram No. 1 showing only the West Side lines, may be taken as fairly representing the conditions of the distribution of the traffic up and down the island for all the lines.

On diagram No. 2 we have plotted the number of seats needed between each station, each way, to transport in 24 hours 511,040 passengers.

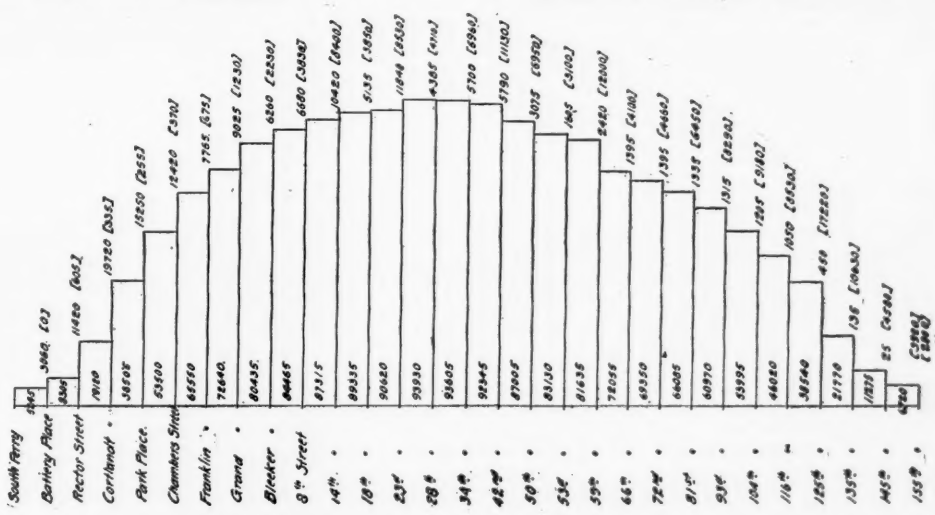


Diagram No. 2.—Station to Station Traffic.

The unbracketed number at each station gives the number of people getting on at the station going up or the number getting off going down; the bracketed numbers give those getting off going up or getting on going down. The difference is used for plotting the diagram. The greatest number is between Twenty-third and Twenty-eighth streets.

In view of the difficulties in the way of an acceptable rapid-transit scheme, it may be instructive to consider this day's traffic from two points of view, viz.:

First, the necessity, at present, for additional lines of rapid transit for the district north of the Harlem River, relatively to the far greater demands on the Island of Manhattan.

This supra-Harlem district is now served by five lines of railroad, viz., the Suburban branch of the Manhattan, 3¾ miles long, the Port Morris branch of the New York, New Haven & Hartford, the New York Central, the Harlem River Railroad and the New York & Putnam. The total number of passengers delivered by these roads is approximately as follows: Total traffic of Suburban branch Manhattan Railway, 28,755; total traffic of New York & Putnam Railroad delivered to the Manhattan Railway at 155th street, about 2,800. There are delivered to the Manhattan Railway at Grand Central station about 6,000 passengers per day, part of whom are through passengers. These figures do not indicate, considering that all these lines have been in operation for a number of years, that this district is not served fairly well.

Second. How much will the people of New York be benefited by express-train service?

By selecting the stations on diagram No. 1, which would appear as the most desirable ones for the express stations, we can made a reasonable estimate of the number of persons who would be benefited by an express service. For the purpose of illustration we will take Rector, Cortlandt, Park Place, Chambers, 14th, 23d, 42d, 59th, 81st, 104th, 125th, and 155th streets.

Diagram No. 3 gives the total number of passengers traveling each way between these stations, or 47,620, and this could be assumed as the number that would use the express trains, *if these trains went with the same frequency as the local trains*, less those who travel between the first four stations named and between 14th and 23d streets who would gain nothing in time.

It is not "business sense," however, to suppose that any management would run express trains more frequently than the amount of the traffic would justify. We will assume experimentally that the local trains run every *one and a half minutes* and the express trains every *twelve minutes* during the busy hours. As a general principle, a passenger who would not save more than two, four, six or eight minutes would not wait two, four, six or eight minutes for an express.

When we approach the subject of relative speeds for the local and express trains, which governs the saving of time to be made, we are met by visionary claims as to the high speeds possible for the express trains and unfair and unreasonable comparisons with the present speed of the elevated railroad. We hear of "40 miles an hour between terminals" for trains stopping once in a mile, compared to the 12 miles an hour between terminals for the present service.

It is true that trains are running 40 and more miles an hour on many railroads, but not stopping at mile stations. The Empire Express runs from Albany to New York at 53 miles an hour, but it does not make any stop in the distance of 143 miles. Express trains between New York and Philadelphia (90 miles) make 48 miles an hour, stopping only once. But trains stopping on an average of once in four miles make only 30 miles an hour.

The motors which can handle trains upon any rapid transit system, with stops one mile apart, at an average speed of 27 miles, will be doing good work. These same motors, stopping at the more frequent stations, would probably make an average speed of 16 miles.

Now, in comparing the local and express trains, we will use the above speeds of 27 miles for express and 16 miles for local for determining the gains in time.

At these relative speeds the passengers on our diagram No. 3 would, on the assumption that the local and express trains from each station started at the same time, make the following savings in time:

a	375	would save	nothing.
b	1,920	" "	less than 2 minutes
c	2,490	" "	2 minutes.
d	8,010	" "	3 "
e	7,100	" "	4 "
f	5,595	" "	5 "
g	3,000	" "	6 "
h	3,525	" "	7 "
i	2,000	" "	8 "
j	1,760	" "	9 "
k	800	" "	10 "
l	2,720	" "	11 "
m	1,325	" "	12 "

If the locals run every minute and a half, during the whole 24 hours, and the expresses every 12 minutes, only about ⅓ of b. and c., ¼ d. and e., ⅖ f., ½ g., ⅝ h. and i., ¾ j. and k., ⅞ l. and all of m., or 17,880 passengers, 37.5 per cent. of the total using these stations would gain any time by use of the express trains.

Should the intervals for the trains be double the above assumption, or three and 24 minutes, only 7,500 passengers, or 16 per cent., would be benefited by the express service.

As about one-half of the total passengers for 24 hours are carried during the busy hours, when the intervals are short, we find that for the whole day, 37.5 per cent. of one-half and 16 per cent. of the remaining half would be a liberal estimate of the proportion of passengers from these stations who would gain by use of the express trains.

This gives 12,700 passengers out of a total traffic of 155,520 passengers each way, or 8 per cent.

Of course this conclusion will be met by the statement that it does not consider those who will transfer from the locals to the express trains from other stations. The recent discussion of the transfer at 129th street does not show a favorable view by the traveling public of transfers. Moreover this kind of a transfer will require a certain amount of time and an accurate knowledge by the passenger of the relation of his train [to the following express in order to figure for any saving of time. Any gain to the number of express passengers by transfer from locals to express, or vice versa, would be more than counterbalanced by those who would prefer to take the first train, local or express, rather than risk a seat or loss of time by miscalculation.

The line of argument has been made upon the stations selected and it may be claimed that a different selection, either less frequently or, on the contrary, more frequently, would prove more favorable. But if we take the stations farther apart to gain greater speed we lose in numbers and if we increase the stations to get greater numbers, we must reduce our average speed.

It will be seen that we have given one express to every eight locals, whereas the express passengers are only about one-twelfth of the total traffic.

If the line of reasoning as above expressed is correct, and the facts accepted as sufficiently true to form the estimates, is it wise to block the whole rapid-transit scheme for New York City, depriving the whole people of increased facilities, by *doubling* the cost of an underground system to furnish express service to about 8 per cent. of the passengers, without increased fare and whose saving of time will not average *five* minutes?

An increased fare would not remedy matters, for the number using the express would rapidly fall off with additional fare.

Moreover, is it not vastly more important to give greater relief to our thickly settled tenement house districts, both from consideration for the people and the real estate therein, than to hamper any new system with a long line above the Harlem River which will not pay running expenses for years?

Mozier's "19-Order" Signal.

The engravings herewith show the apparatus recently designed by Mr. A. M. Mozier, Superintendent of Transportation of the Erie Road at Cleveland, and heretofore described in the *Railroad Gazette*, for delivering telegraphic train orders to enginemen and conductors while the train is running at full speed. It acts like a mail-bag "catcher." On the Ohio lines of the Erie, "19" orders, those which do not require the signature of the engineman or conductor, are delivered to trains of inferior right without stopping them, and this apparatus has been got up so as to avoid the necessity of slackening speed. The signal has an arm taking three positions like Mr. Mozier's three-position semaphore; if the regular block signal indicates all clear an engineman approaching the order signal does not stop, but simply takes from the signal a sack containing his order by extending his hand as he approaches the post. A bull's eye in the side of the signal lamp throws light upon the sack at night so that it can be readily seen. No catching apparatus has been attached to engines or cabooses, that being deemed unnecessary. This method of dealing with train orders can of course be adopted with a high degree of confidence where a block system is used, as on the Erie. Many "19" orders might be safely delivered even without a block system, but with it there is theoretically no danger in delivering orders in this way to ruling trains as well as to inferior.

Train orders to be delivered by this apparatus are placed in water-proof envelopes, and these in turn are enclosed in a stout cloth pouch, fastened to an elastic strap, which is attached by rings at either end to projecting arms, as shown in the engraving. The semaphore arm and the accompanying lamp and glasses are similar in appearance to those of an ordinary signal. In Fig. 1 the lower lens is red and the upper green. The lamp is supported by the iron bracket projecting upward at the end of the supporting arm. This arm is adjustable, so that the post does not have to be set at any precise distance from the rail.

Fig. 1 shows the signal set for an approaching train. The spectacle casting and the semaphore arm are rigidly attached to each other and revolve on a pivot in the usual manner. Fig. 2 shows the signal in the position which it automatically assumes after the engineman has taken off the pouch containing his order, and before the conductor has reached the signal. Fig. 3 shows the signal in the position which it moves to after the conductor has taken off his pouch, this being the position in which it is left to indicate "no orders," though when not in use the bracket on which the delivering arms are supported can be swung around parallel to the track, and fastened in that position. The mechanical details for producing the automatic action are very simple. Of the two arms for holding each pouch, the upper one is rigidly fixed to the spectacle casting, while the lower one drops by its own weight except when the pouch, with its elastic body, is in position, holding it up. On the withdrawal of the first or lower pouch (the engineman's) the lower arm drops and its rear end, extending backward from the pivot supporting it, and holding in position the whole casting and all four arms by resting upon a pin projecting from the bracket which supports the signal, loses its rigidity and permits the other three arms and the spectacle casting (which, combined, are heavier than the semaphore arm) to drop, also, until the lower one of the upper pair of arms strikes the same stop on the supporting bracket, which before had prevented the lower arm from dropping too far. When the conductor withdraws the second pouch the lower one of the two upper arms is loosened in the same way that the first one was and the whole casting drops until its motion is arrested by a permanent stop.

This machine has undergone numerous tests with trains running at high speed. The pouches have been taken off with perfect ease at 55 miles an hour, and the trainmen say that there is no trouble at any attainable speed. The points where these signals are to be placed for more extended tests are: Hubbard, O., on the Mahoning division; Mill Village, Pa., on the Meadville division; Milton, O., on the Cincinnati division; Alger, O., on the Lima division, and Akron, Ind., on the Chicago division.

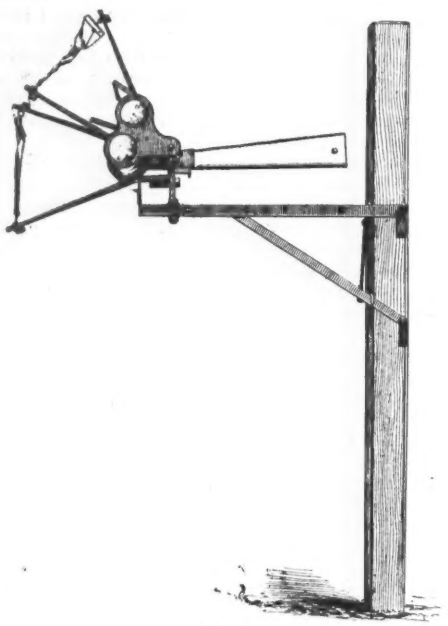


Fig. 1.

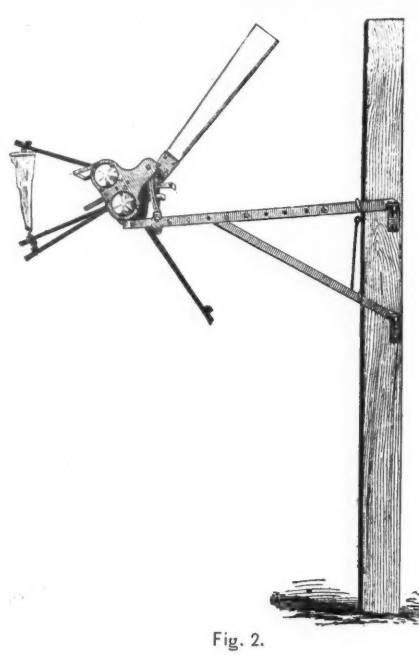


Fig. 2.

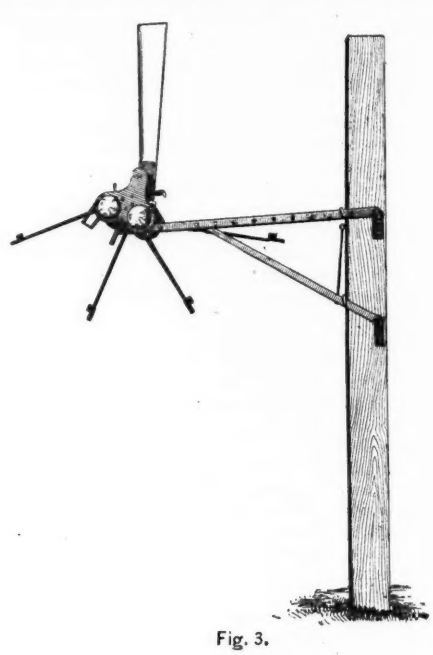


Fig. 3.

Mozier's Signal for Delivering Messages to Moving Trains.

Fig. 1, Ready for Engineman; Fig. 2, Ready for Conductor.

Long-Distance and Heavy-Duty Electric Railroads.*

BY F. W. DARLINGTON.

So far as the motor alone is concerned there is no longer a possibility of doubting its ability to do the work of a steam locomotive. It can make a car move as fast and faster. It can pull heavier loads by reason of its power being supplied from some exterior source, and hence, having practically an unlimited supply, it can climb steeper grades, and it can reduce expenses. Can more than this be asked of it? I think not.

There remains, however, the question of how to transmit the electricity from the stationary engine and boiler plant to the motor on the car. It has been proved beyond doubt that power can be developed in a stationary power-house at a large saving of coal and other expenses. Of this fact, and that of the ability of the motor to do all the work demanded of it, there is no difficulty in convincing the steam railroad man. But the inability to prove beyond a doubt that the power can be transmitted satisfactorily for long distances is where the failure lies. This is the one point to be worked out and demonstrated before there will be any general adoption of electricity for long distance roads.

There have been many theories advanced and systems proposed, but as yet but an insignificant number of them have been tried, and they only for very short distances! This question must be solved, and all are looking for the solution in the alternating-current system, but whether this or the direct-current system is the solution is still an open question. It must be borne in mind that the depression in the financial situation for the last two years is the reason more than any other that steam roads have not been changed to electricity. So that with the country enjoying even moderate prosperity there is sure to be extensive and widespread experiment in this line, and it is not too much to say that in five years' time there will be such a change in the minds of financial and railroad men that there will be a rush to obtain the benefits of the reduced operating expenses to be derived from using electricity. This assertion may seem wild and romantic, but any close observer of the thought and the attention given this subject by the large steam railroad companies will bear out this statement. It does not mean that people will go wild over it, for that period in electric railroad history is past, and all should be thankful for it. But it does mean that with money available there will be a general start to equip both long and short roads.

What has all this to do with suburban and inter-urban railways as existing to-day? It is a question of vital interest to all those companies operating such roads. For all managers of local roads, whether they be running between towns or are purely local, if they in any measure parallel steam roads, have this fact staring them in the face, that it is only a matter of time, and a short time at that, before they will have real competition from those same roads whose territory they so profitably invaded.

They (the local managers) must know that a trunk line supplied with such power as it will require can be tapped at any point to run a local road or branch line, at but small expense in comparison with that required to operate the local road independently. Then, too, let him think what it would mean to him to have a competing line with frequent service, and maintaining high speed on safe roadbeds. . . .

It is safe to say that at least 75 per cent. of the electric railroads in this state are paying too much for their power. . . . Few, if any, are paying dividends, and many are in the hands of receivers, when it would be possible to make all pay, excepting, of course, those wildcat schemes floated to fleece people of their good dollars. . . .

The reports obtained from many roads vary to such an extent that it is impossible to assume any given amount at any given place without knowing the conditions existing there. It might be stated here that a car-mile should be produced for a given number of cents, based on these reports, and nothing of real value toward the solution of the question at hand would be gained, for all the calculations and reports made on power questions have been based on results at the power-house, or at the switchboard, which is only a part of the proof, for they take no account of interest or line losses and motor repairs, which are all necessary for determining definitely as to the cost of a car-mile. For of what use is it to calculate your power in kilowatt hours at the power-house and in that calculation consider only your coal, water, supplies and labor, when you omit all account of your interest except as a lump sum? And of what use is it to define your motor repairs and car expenses in car-miles when here, too, you lose sight of interest?

How can you tell how these several items compare unless you base them all on the same unit? This unit should be in car-miles, for expenses of every description, and when they are so calculated you have the true basis, for all expenses are incurred for the one object of propelling cars certain number of miles. . . .

When it comes to competing with the steam roads as they exist to-day, the electric road attracts local travel because of its cars being run at frequent and regular intervals, whereas a traveler must consult a time table

*From a paper read before the Pennsylvania Street Railway Association, Altoona, Pa., Sept. 2.

before taking a train on a steam road. Again, in summer time the electric road offers the additional inducement of a cool, clean ride, while on the steam road if one opens the window for fresh air he is treated to a shower of coal dirt, cinders and dust, to such an extent that when the journey is over the passenger is more uncomfortable than when he started. All this is destined to change, however, for the undoubted tendency of steam-railroad travel between large cities is to move trains at more regular and more frequent intervals. This is indicated by time-table records for some years back. The clean travel will come when electricity is adopted.

The question of the real meaning of the difference in number of trains running on competing roads is shown very clearly on the roads operating between Philadelphia and New York. Of these two roads the Pennsylvania gives by far the most trains and the result is that it gets the most of the travel. This is natural for the reason that a man bound to New York from Philadelphia will buy his ticket by the route that will give him the greatest choice of times to start on his return. Carrying the comparison farther, suppose an electric road was built between the two cities and built so that it could land passengers in New York as quickly as the steam roads and a train service every 15 minutes or a half hour be maintained, there is no doubt that it would get the bulk of the travel.

As for speed, if a speed of 72 miles an hour can be obtained on a road seven miles long and be maintained for three miles, as has been done on the electric road installed by the Pennsylvania Railroad Company in New Jersey, it certainly would be no more difficult to obtain a speed of 80 to 90 miles an hour on a Philadelphia-New York line. . . .

I have observed with interest the fact that the majority of trains leaving the Broad Street Station, Philadelphia, are composed of a combination car and two or three trailers and that trains of more than four trailers are not frequent. It therefore seems to indicate that a motor car of sufficient capacity to draw these trailers at the desired speed could be made a standard and do all the work. This might necessitate making two sections of the through trains, but this would prove a benefit to the traveler, especially if the two trains were scheduled to run at different times.

Right here it might be interesting to consider what we are to have in the place of the steam locomotive. It can be demonstrated conclusively that when we discard the steam locomotive, the most economical and convenient method will be to put the motor under a baggage or combination car, for if we attempt to follow steam-railroad practice and carry enough weight on an electric locomotive to provide traction for a train, we will have to add useless weight, and one of the chief sources of economy of the electric system over the steam is from the reduction of the weight of the train. The weight can be done away with because of the fact that the even pull, at a tangent to the circumference of the motor armature, produces an apparently greater possible traction effort per ton of weight, and in addition reduces the tendency of the wheels to slip at starting.

This feature of the electric motor is the one above all others that establishes the fact that it has come to stay, no matter what developments may be made in air, gas or other motors which have to convert a reciprocating into a rotating motion.

And the fact that an electric motor supplied directly from a central power-house gives to that motor a practically unlimited supply to draw from, puts it far ahead of any motor which carries its supplies on its back, whether it be in air tanks, storage batteries, oil reservoirs, or coal and water bunkers. Any storage reservoir must be refilled and this takes time. And all time used in this way is dead loss, and means that the motor cannot make as many miles in a day.

One more point in favor of the electric motor is that where they are equipped with double motors and two controllers, there is no one thing that can happen to prevent the motorman from getting his train to its terminus, for with the modern apparatus he can cut out the motor or line giving trouble and proceed with one motor. To be sure his speed will be decreased, but still he will be able to move his train, whereas in any of the above cases there are a number of accidents, and trivial ones, that may happen to cause the train to wait for a new motor. Of course, the question of the supply line, or feeder system, is ignored in this statement; but with the advent of electricity on steam roads, will undoubtedly come a feeder system practically impossible to interrupt.

The question arises when considering cars for high-speed work as to what kind of motor trucks should be used.

The advocates of maximum traction trucks refer to the steam locomotive as their model, but there are some principles in use on the steam roads which we must avoid and this is one. The steam locomotive is of necessity a maximum traction machine, but it has been demonstrated that a car can be started and propelled with less power when the trucks have a motor on each axle (*i. e.*, four motors on an eight-wheeled car), than where equipped with a motor on each pair of axles (*i. e.*, two motors to an eight-wheeled car), and this, too, when the four motors are of greater weight than the two larger motors.

These so-called maximum traction trucks with one pair of small wheels are lately provided with some kind of device to hold down the small wheels to keep them from jumping the track. This deprives the truck of most of the efficient traction obtained by putting the weight nearer the axle of the larger wheels, so that the results obtained are practically no better than were the light wheels made the same size as those carrying the motor and the weight of the car placed centrally over the truck.

It will be noticed, too, that a maximum traction truck rides more roughly than a regular truck; this for the reason that the car support is placed more over one axle than the other and thus gets practically the same hammer motion that the motor does, and does not get the relief given by equalizing and dividing the motion of both axles, as found on regular trucks. In this question of trucks, as we approach nearer the practice of steam roads in other respects, we will find it to our advantage to be guided by their experience and not attempt to drag with us the crude ideas heretofore held. It is only just to say here that most builders of trucks have recognized this point since the building of these roads mentioned at the beginning of the paper, and have been trying to educate their customers to this belief, and with some measure of success. . . .

National Railroad Blacksmiths' Association.

The association held its fourth annual meeting at the Tremont House, Chicago, Sept. 1-3. The meeting was called to order by President S. Uren, of the Southern Pacific. About 65 delegates were present. Mayor George B. Swift, of Chicago, welcomed the delegates to the city. The Treasurer's report showed a good balance. The Secretary reported that since the last meeting held at Cleveland, O., 33 new members have been elected. Including the 24 new members elected at the Chicago meeting the total membership of the association is now 144. President Uren, in his introductory address, gave a short resume of the history of the organization, which was formed in Chicago in 1893, with a membership of about 30. He congratulated the members on the progress which had been made in the three years. The first report of the association was a small pamphlet of 24 pages and the third report of the proceedings of the association contained 104 pages of committee reports and discussions. President Uren suggested to the members the value of frequent visits to the shops of other companies for the purpose of noting new and improved devices which could be introduced in their own shops. He thought that when returning from the present convention the members should visit different shops on their routes so far as their time allowed. He himself followed this plan on his return journey from the last convention and was able to introduce in his shops at Sacramento many ingenious devices which he had noted in operation at various shops.

The report of the Committee on Forges and Tuyeres, Andrew Younger (S. P.), Chairman, was then read, from which we take the following:

The common square or round forges are good enough for ordinary blacksmith work. The position of the tuyere, however, varies, some smiths preferring the old style, which is placed horizontally in the forge and through which the blast is discharged to the center of the fire. This is not considered so effective in heating as when the blast enters the fire from the bottom, through a square iron blast box, which is provided with an opening in the top, fitted with a cast-iron grating having from one to four oblong holes, ⅝ in. × 2 in., the grating with a single hole being large enough for light work. These gratings can be removed and replaced by new ones, though if the blast box is kept clear of cinders and dirt they do not burn out. In the bottom of the blast box is a slide, which, when pulled out, allows all dirt and cinders to be removed.

Mr. LOOKER (Ann Arbor) described a tuyere iron used in connection with a round forge. For a deep fire he had a box 12 in. long, 9 in. wide and 5 in. deep, with a double blast and a long lid to cover it. In the center of one lid are two slots 3 in. × ⅝ in., and there is another lid with four slots. One lid could be taken off and another put on, according as it was desired to get a long or short heat. Some smiths did not like this iron on account of its clogging up, but he had it so arranged that the lid could be taken off and poker put down to let out the dirt.

Mr. COLEMAN (C. & N. W.): We use a common tuyere iron with a cast-iron box underneath. We have the side blast at our common forges, and underneath the tuyere iron we have the box, which is about 7 in. square and 6 or 7 in. deep, with a slide in the bottom, and we find it very convenient in dumping the fire and saving coal. When we come to clean out we do not mix the loose coal with the dirt that drops through. I think we save at least one-quarter in coal over the old plan of shovelling out the fires with the solid bottom. There is also a considerable saving in time in cleaning the fires; we clean them in from three to five minutes. It is a simple device, just a common box with a slide in the bottom, dropped down about six inches below the tuyere iron. I use a double blast in the big fire, where we weld frames and do large work.

Mr. ROBBINS (Fitchburg): I have been using what is called in the East a standard tuyere. It has a cone-shaped top, with an oblong hole about 2 in. × 1⅛ in. with a ball that is worked by a lever fitted into it. In the center of the ball is a hole about ¾ in. in diameter. When it is desired to run a small fire, by bearing down on the lever, it throws the ball up, closes the large hole and allows the blast to circulate through the small hole in the ball. At the bottom of the tuyere is a clapper which lifts out and allows the dirt and ashes that pass down through the tuyere into the ash-box to be cleaned out very readily. The advantage of the cone-shaped top of the tuyere is that all slack and cinders run off below the outlet of the tuyere, thus preventing clogging.

The Committee on "The Best Method of Manufacturing Axles," J. E. Mick (B. & O., S. W.), Chairman, submitted a report, a part of which is as follows:

To make a good wrought-iron axle, we must have a good reverberatory furnace, clean gaseous coal, good scrap, steam hammer, suitable tools and the necessary help required to do the work. Use such scrap as old arch bars, bridge plates, bridge rods, small car axles, etc. All scrap should be milled so that no foreign matter remains upon the iron.

Cut your scrap into lengths of 18 in., having piling boards cut from any rejected lumber 18 in. long, 10 to 12 in. wide by from ⅞ to 1¼ in. in thickness. Also have a quantity of muck iron or some iron that is nearest muck iron, such as splice bars, fish-plates, etc., well milled and cut to lengths as above, and add about 30 per cent. of this muck iron to each pile you put up, well distributed. The slabs will not be so dry and there will be less danger of fire cracks, as the amount of flux will be greater. In piling your scrap use Beattie's system of piling. The iron so piled and worked into slabs and then into axles will stand severe tests, as the fibers are entwined about each other in such a manner that when the axle is completed it seems almost impossible to break it, provided the iron has been properly heated.

The reason for making a muck-bar axle is because we cannot get wrought-iron scrap that is free from steel. You will have more or less soft steel pieces mixed through the scrap pile, and it cannot be detected. So it will be worked, and the result will be a weak place inside of the slab.

If a piece of steel gets into a pile of wrought scrap and the pile is worked into a slab, you will find if you break the slab that the iron has all been worked into one mass, or changed from a lot of small pieces into one piece, but you will that piece of steel in about the same shape or condition when it went into the pile. You will also find that the iron has worked over and passed by the steel, from the fact of the steel being hard and the iron being soft, and the iron keeps moving over the steel. At every blow of the hammer, you will find also that right at that point where the steel is located the slab is weaker than at any other place. With such contingencies, how can we build an iron axle that will stand the M. C. B. test, as was recommended by the committee at the last meeting of that association?

Mr. UREN objected to the use of old fish-plates, on the ground that when it is put into the axles it makes a streak of iron from one end to the other, very brittle and crystalline.

Mr. WILLLIAMS (C. A. & C.) said that the way the test is made almost anything will stand in an axle now. He believed the axle was tested in the best part of it; he would not test an axle in the middle, because that is the best part of it—anywhere from 10 to 18 in. from the end is the place to test the axle; they always break in that place; he never saw an axle break in the middle from actual wear and tear. He got a little information from a steam forge man, and he used axle turnings to physic his iron; it was known that old scrap iron worked a good many times is very dry and liable to fire cracks, and he used axle turnings when the piling was in the furnace, previous to turning it over, taking a shovel and putting perhaps 6 or 8 lbs. on each pile.

Mr. JUDY (B. & S. Car Co.) took exception to the statement of the last speaker as to the breaking of axles. To say that axles do not break in the center is a mistake; he had seen fine axles break inside of one week within three inches of the center, supposed to be first-class axles, both iron and steel. There is one thing that has been proved—the muck-bar axle, made from muck bar, that is from the original iron, the puddle iron, turned into the bar and then into the axle, has stood the best test of any axle made, and yet it has shown some ugly flaws in the journals.

Mr. UREN: The center is worked down to a blood red heat, and no iron attains its strength until it is worked to that heat. The end of the axle is finished at a white heat, and then placed in water for the purpose of cooling it. Consequently, the 5-in. part of the axles have not had the same working as the 4¼-in. part, and for that reason it is more crystalline, and my experience is that 25 per cent. more axles break at the wheel fit than in the center.

Mr. MICK: The difficulty arises from the fact that the workman does not have the fire bridge in the proper shape, and the heat is greater where the wheel fit is than at the center, and it becomes fire cracked, and after the axle is in service it will break behind the wheel, because the axle was injured in heating.

Mr. NORRIS (Carnegie Steel Co.): I think the axle breaks back of the wheel-fit for this reason. Right back of the wheel-fit is a step, and it is stepped from 5⅝ in. to 5¼ in., and then tapered down to the center. Don't you think that has something to do with it breaking at that point?

Mr. BURGESS (C. & E. J.): If there is a lump on an axle, the vibration will center in this place where the axle is held, and it will not break in the center, but invariably right back of where it is pinched. Car axles when running will get overheated and are cooled off with water, and that process goes on, and it is easy to see why the axles break at the journal.

Mr. FITZGERALD (C., M. & St. P.): The experience has been on our road that most of the axles break behind the wheel seat. The great objection they have to the steel axles which are on the road is that they break off quick, whereas the iron axles commence to crack and the man who examines them has a chance to see the cracks in time to take the axles out so as to avoid a wreck. I experimented a good deal with scrap last spring, and the result of my experiments was that the best scrap to make axles out of is old coupling links and some round iron to fill in with.

Mr. MOULD moved that the subject be carried over to the next meeting. Carried.

On motion, adjournment was made.

On Wednesday morning the report of the Committee on the Best Method of Constructing and Repairing Locomotive Frames, H. H. Hoeffle (Pittsburgh Locomotive Works) Chairman, was read, an abstract of which follows:

A good forging cannot be produced unless you have good material to start with. Too much attention cannot be paid to the scrap pile. Steel and other foreign material should be avoided. In preparing the piles for the heating furnace, muck-bar iron should be at hand and mixed in the scrap; this will make the iron more fibrous. Double refined iron is still better than the raw muck bar. It has been fully demonstrated that under reasonable conditions it is advisable and to be recommended that a frame back should be forged in one piece. No weld should exist or be recommended in the construction of a new frame back. The frame limbs and braces should also be forged at the hammer. When the

different forgings have been completed at the hammer and the forging in question turned over to the blacksmith for final construction, too much skill cannot be displayed by the workman in welding the different parts together. This requires that the iron should be at the right welding heat to obtain the required results. A great deal depends, however, on the preparing for the weld. The frame back should be V-shaped at an angle of 45 or 50 deg., the limb should be split; the angle should be well open in order to secure the union at the apex of the angle, provision being made for the necessary amount of stock required to make the weld. The welding should be executed under the steam hammer. One very important point in welding a limb to the main frame bar is to have a good foundation for the limb so that when the welding is complete it is easy to adjust the limb to the required gage and not disturb the weld.

Repairing locomotive frames is a very frequent occurrence. Some foreman may be of the opinion that when part of a frame is broken it should be cut out and replaced by a new piece. This method is economical and good practice is unquestioned. Very frequently we have a broken frame through the back, the frame being otherwise in good condition; it is quite practical to cut out of frame a V-shaped section at the point of fracture, making provision for the amount of material it will require for welding. The parts should be firmly clamped together in view of holding them in the proper position. Weld in a piece that has been prepared for that purpose, the frame then turned over and the same operation repeated, and, if the proper care is exercised, the repairing of a fracture of this kind will meet with good results.

In no case should the fibers of iron be crossed in welding. . . . In cases where frames are badly bent or kinked, it requires skill to straighten them. To do this, it is advisable to cut the brace, then the frame can be straightened, and, in rewelding the brace, care must be taken to keep the frame straight.

The remainder of the morning session was devoted to the discussion of the foregoing papers, but as the remarks made were illustrated by diagrams they would not be intelligible without the illustrations. These will appear later in the regular report of the association. The discussion was also resumed in the afternoon session.

The Report of the Committee on Designs of Furnaces and Economy of Fuel, George L. Lindsay (E. & T. H.), Chairman, was next in order. The report follows in part:

The usual forging furnaces are only used in large shops, and then mostly for axles, shingling or heavy forging. In small shops, as a rule, there is not hammer power enough to operate them economically, as it costs from $19 to $22 a day to operate such a furnace. Hence, to be economical, the coke furnace described in our last report comes into more general use. This furnace may be improved in having an outer wall with 3-in. space for the circulation of air, with a few holes 3 or 4 in. on the side to make it more comfortable to work at. The heat thrown off of the outside of the inner wall is carried off into the space so much so that one could hardly tell that the furnace was working. We have seen water jackets and other methods used to serve this purpose, but prefer the double wall. For small furnaces, such as bolt forging or bending on car work, we are of the opinion that oil is the best fuel, both as to economy and efficiency. The efficiency of oil furnaces is very much improved when the blast pipe is brought in contact with the flame after it has done its work in the furnace. By this means the blast may be heated quite hot and in that order the oil may be conducted along the steam pipe of the steam hammer. By this method the oil also is heated and becomes very fluid.

Oil is also a very suitable fuel for spring work. The construction of a spring furnace is also different in many shops. Some prefer to put the burner in the side, others on the end. Whether on side or end, there should be a space of about 6 or 8 in. from the nozzle of the burner to a bevel brick bridge placed so that the oil and blast will strike. This will spray the oil, and then the course of the flame should not be obstructed by square corners, as it will be easily understood that striking squarely into a brick wall will stop the heating capacity. The flame should have a rolling motion going to every nook inside the furnace and heating it evenly throughout. If the burner be placed on the end, the same bevel bridge of brick is used and throws the oil to the roof of the furnace where it strikes a reverse bevel brick throwing the flame down to the bottom of the furnace, thence along to the small stack 4½ in. square, 24 in. high, located about 8 in. from the opening. A furnace of this class on spring work will run 20 to 24 hours on 50 gallons of oil and can be kept at the proper heat very easily Another very good spring furnace is used on spring work on the same principle as the sand-bottom soft coal furnace. For flue work oil has also been in use in some places. We use hard coal with success. The mandril on which the flue is welded enters the furnace so that we do not require to lift the flue out of the fire but only push it through. By this method we have a sleeve or thimble to fit the various lengths and upset against this and the die of the machine, then raising the upper die allows the flue and sleeve to pass to the proper position be welded. In some places they mix hard coal with coke, but hard anthracite coal is probably best for this purpose.

Mr. Boyle (C., B. & Q.): We have been using oil in our furnaces for the last six years; furnaces for heating bolts, and also for bending iron and all shapes for car work. We consider them to be much cheaper than either coal or coke. We have an oil furnace which costs from $15 to $20, with which we can turn out four to five thousand ¾-in. bolts in ten hours, at a cost of about two cents per hundred for fuel. For bending arch bars and all other kind of car work, we use a furnace that was originally built for soft coal, Indiana block, that used to cost us in the neighborhood of $8 or $10 a day. With the oil we can bend five to six hundred arch bars for about $2 cost of fuel. The furnace which we use for bolt making is constructed with four legs, about 25 in. high, the proper height for a man to stand at, with a common frog plate, 22 × 54 in., placed on top of the four legs for a foundation body. We have two burners, one in each end of the furnace. The furnace is built on this frog plate. The front of the furnace has one brick standing on end about 9 in. high. The end of the furnace where the burners come in has one brick laid flatwise, 4 in. The back of the furnace has one brick laid flat endwise, and then these bricks are crossed and recrossed up to about 22 or 23 in., with a top of brick laid edgewise, and compressed with a band of iron 3 × ¾ in.

Mr. Walker (C., B. & Q.): We only use oil in furnaces where we are making springs. For making iron axles, etc., we use what was built for a gas furnace. We have been using it for eight years, and I never saw an axle charred on the ends. It is never any hotter there than back against the door.

Mr. Norris: I would like to see a sketch of that furnace which does not burn the ends of the iron. We have 14 or 15 furnaces, and there is not one that will not burn the end of a piece of iron or steel.

Mr. Walker: The grate bar is so arranged that you can clinker it and do not have to stop the furnace. The only blast we have is a ⅛-in. steam jet flowing into a 6-in. pipe that takes all the air necessary. It heats in about the same time as the old furnace, or a little slower, if anything. The checker work goes 5 ft. down in the ground, so as to give the air a large space, and it has to travel a good distance before it gets up to the top in order to get warm. The walls are 11 ft. high. We use more coal than we did with our reverberatory furnaces. These are larger and capable of doing more work; we use in the neighborhood of three tons of coal, and get 20 axles for 10 hours' work. In 24 hours we would not burn proportionately so much coal, and would get 48 axles. It takes about five hours to get it up to heat; you have no blast to force it with, nothing but the air, and it takes a long time before you can use the gas.

Mr. Norris: Our coal furnaces are built with cast-iron plates, with the proper openings for the doors, with a fire-door on the end of the furnace. The grate bars are placed in the firebox from the end. We use steam blast in this furnace, which is obtained through a ¾-in. steam pipe, blowing into a bell-ended pipe, which runs down to the bottom of the fire chamber into a square box which has three openings in it. We have one of these square boxes on each side of the firebox, and we get all the blast that is necessary to run the furnace in that way.

The report of the Committee on Machine Forging, by W. W. McLelland (D. & R. G.), was then presented.

As to locomotive and car forgings, money can be saved by the use of machine tools such as steam hammers; with plenty of suitable dies much of the work can be completed at the hammer without any blacksmith's labor, such as main rods, parallel rods, T ends for frame brace, boiler brace ends, together with many other things, such as link hangers, valve ends, etc. In car forgings your committee is of the opinion that bull dozers, large bolt-forging machines, together with steam and power hammer, are indispensable in producing good, cheap work. In fact, we do not know where the dies stop in a car or locomotive shop.

The first business of Thursday morning's session was the report of the Committee on "Tool Steel, Tool Making and Dressing," etc. The report was submitted by G. H. Judy (B. & S. Car Co.) as chairman. The following is taken from the report:

We are getting as good steel as we ever did, but we are called upon to do from 25 to 40 per cent. more work in 10 hours than we did formerly. . . . In tempering we used to take milling cutters, taps and reamers, harden them, and then polish them; then draw them over a piece of hot iron or over the fire to the color. This is all right, if there is no better way, but it takes up much valuable time. It has been found to be a better plan for these tools to temper them to the proper heat, not draw the temper, which can be done by the tool dresser after a little practice.

A plan which is no doubt the best is to order your steel for the purpose for which it is intended. It will be necessary to keep in stock three grades of steel, in order to have a good lot of tools in the shop.

As for expensive tools, such as milling tools, large reamers and taps, the steel should be ordered to size, stating what it is to be used for, and be ordered annealed. There should be no smith labor on the tools, only to temper them.

For lathes, planers, slotters and drills, another grade should be ordered, but not annealed. For smith shop and track tools still another grade is used. This steel should be much softer, and is not fit for machine-shop tools at all.

Knowing full well that small differences in heat produce radical results, I have for the last year and a half hardened all my work at a practically uniform temperature, nd during the last eight months used my thermopyrometer in practical every-day work with gratifying results.

Mr. Burgess: I would just as soon expect to get one grade of steel to answer all purposes as I would to get one blacksmith that was equally good at spring-making, tool dressing, and, to carry the thing further, as a frame maker. We have not only one, but quite a number of steel makers in this country that can turn out as good a quality of steel as anywhere on the globe. The American manufacturers have reached a point, where if you will tell them the use for which the steel is intended, they will send you a steel which will do the work satisfactorily.

Mr. Mick: The report of the committee says that they do not think you can restore steel. I do not claim that you can get the steel to its original condition, but you can partially restore it and use it for the purpose for which it was intended. Sometimes a seam will appear along the center of a chisel, and after a few blows off comes the piece of steel right up into the seam. If the chisel won't stand you burn it. Have a gallon of black oil, with a large spoonful of saltpeter in it, and after the heat recedes to a low cherry red, dip the tool into the oil and cool it off. Take it out, re-heat and dress it, trim off the corners and temper it in the usual way. As far back as the chisel is burned, where the seam was, it will stand first rate; perhaps as well as was at first expected.

Mr. G. H Williams: There are very few men who can take an open fire and heat a piece of steel as it should be heated. There is a great deal in eyesight. You may get a man that will see a heat at a certain degree, and he may be above or below the required heat. I not only advocate heating steel in a furnace at a proper heat, but also that it should be done in a darkened room.

Mr. Mould: If you have never tried a common fire brick fire, heated with hard coke or hard coal, for dressing tools, I would advise you to give it a trial, and you will never go back to an open fire, and expect good success in dressing tools.

The report of the Committee on Flue Welding by H. G. Finn (West Shore) was then read:

On our road we have been but flue welding for the past year (since June, 1895). We have about 100 engines on the road with butt welded flues, and have not had one give out or leak. It is my opinion that it is the best way to weld them. We cut the safe ends 6½ in. long off No. 10 flues, and our flues are No. 12, cut square off. We put the safe end on the mandril, with the collar about three inches from the end, and they are put in a small furnace. We use hard coke. Butt them together, and when they get hot enough to stick, give the mandril one sharp blow with a four pound hammer. Then it is ready to weld. When the heat comes up give the mandril three good blows with the hammer and it is welded. Then take it out of the fire and swedge it to size. In this way you will make a perfect weld every time, and the flue is full thickness at the weld. In this way we can weld 250 flues in 10 hours.

Mr. Kelley: If a butt welded flue breaks, it breaks badly and blows out. If a lap-welded flue breaks it does not make so much delay.

Mr. Finn: We are running now 220 engines, and very nearly all of them are supplied with the butt welded flues. In 1895 we put in 21,523 flues. We have now running on the road 23,757, and there is no complaint, whereas with the scarfed weld we always had trouble. They would drop off in the tumbler.

Mr. Kelley: A flue being welded several times, and being cleaned, the flue becomes light; do you find any trouble in welding it then?

Mr. Finn: No. We put them straight in the small furnace and let them lie until they get warm on the bottom, enough to stick, then give one blow and turn over to take the heat; then give it three or four hard blows. I never saw one buckle. They come out in good shape. We weld 250 a day. We had a small Bradley hammer, but we have done away with it. We find that hammering a flue after it is welded is an injury to it. We use an air roller of our own manufacture.

Mr. McLelland: In Colorado, during the past year, we have welded 26,000 flues, which cost us, from the time they were taken out of the boiler until they were put back, an average of 10 cents each. I went to the shops at Horton, Kan., last Friday. The flues had been prepared for welding. They were scarfed and put together. The furnace was there, and machine alongside of it. At 24 minutes after eight o'clock, the man who was welding laid a welded flue on the floor, and at 24 minutes after nine o'clock, there were 110 more welded flues lying alongside of it. The cost of welding flues this month in Horton will be 6.02 cents. I am not certain that it is what would be called first-class welding, but it answers the purpose. There is no doubt about it that you can weld 100 flues in an hour and not overwork yourself. The fire can be cleaned out in 20 minutes, and is ready for another 100. The shops at Horton have taught us a very valuable lesson.

THURSDAY AFTERNOON SESSION.

The report of the committee on "The Best Method of Handling and Disciplining a Shop," H. A. Folk (P. R. R.), Chairman, was read. It is in part as follows: In the first place, you do not want too many rules; secondly, do not make any rules that you cannot consistently carry out, or that might place you at a disadvantage under some circumstances. Always remember that the men have hearts and feelings, that they are just as sensitive to unkind remarks as you are, hence, it is very necessary that when any of your men are taken to task for neglect of duty, that you keep your temper. There is nothing cuts so deeply into the human heart as when

Fig. 1.—Goodwin Dump Car.

a man is corrected for a fault in a kind yet firm manner, unless the man is so hardened that he cannot realize his offense, in which case you have no room in your shop for him. Do not argue any question of discipline with your men. . . . Foremen should grade their men and pay them according to grade. If a difference is made, and it is properly understood, it will be an inducement to the inferior workman to try to improve. In our shop all the work is done on the contract or piecework system. . . .

The Secretary's report was read and accepted and a vote of thanks was tendered to Secretary J. B. Dickson for faithful and efficient work. New members were then elected.

The afternoon session began with the election of officers for the ensuing year, the results of election being a follows: *President*, Mr. R. Caffrey, Lehigh Valley; 1*st Vice President*, Mr. A. S. Western, N. Y. C; 2*d Vice-President*, Mr. T. Hickey, Mich. Cent.; *Secretary and Treasurer*, Mr. J. B. Dickson, C. & N. W.; member of *Executive Committee*, fo three years, Mr. Wm. Brandt, C. & N. W.

The report of the committee on Tie Plates was then called for, and in the absence of Mr. Robert Black, Chairman of the Committee, the report was read by Mr. J. B. Dickson, Secretary of the Association.

The report was as follows

TIE PLATES.

The committee finds that

First. Tie Plates certainly hold the rail to gage.

Second. They prolong the life of soft wood ties from mechanical decay or wear five or six years, and hard wood ties two to four years.

Third. They are invaluable on curves.

Fourth. That a spike has a better support when used with the tie plate than without, as the tie plate gives the spike a required backing.

Practical experience has shown that any form of tie plate to be successful must unite itself to and become part of the tie. . . . Where the tie plate fails in the imbedment the remedy adopted by the manufacturers seems to have been to increase the thickness of the plate, which does not prevent the undulation of the rails but adds a heavier plate, and while the tie plates are saved, the rail receives increased wear, spotting and spoiling the rails. In an experimental test made by the Pennsylvania Railroad in 1870 of a flat plate six inches square and ⅜ inch thick they acted as an anvil and caused the rail head to show a spot where the wheel struck it immediately over the tie plate. These plates were not imbedded in the tie. About 1880 the Manhattan Railway had a similar experience with a flat plate and were obliged to take them out of the track. In fact they had decided to use no tie plate until those allowing the flange for imbedment came upon the market. It is, therefore obvious that any tie plate that has not a good firm and secure imbedment in timber is useless.

Your committee next considered the ties, in connection with the tie plates, and in looking over many cut ties it became evident that most of the wear is due to the moving rail and even in the softest woods where indentation was to be expected, there was but little appearance of it. It is here that the tie plate proves of the

(*Continued on page 642.*)

Fig. 3.

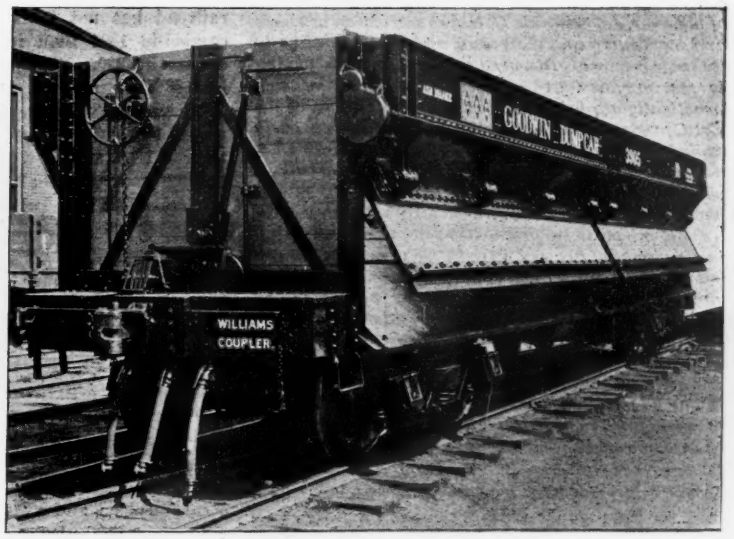


Fig. 4.

New and Improved Steel Frame, Goodwin Dump Car.

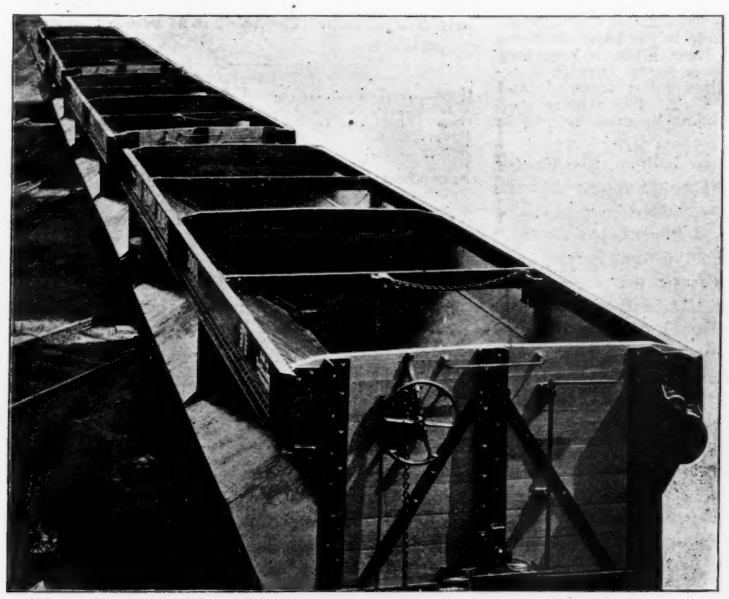


Fig. 5.—Goodwin Dump Car.

The next report was that of the Committee on "Case Hardening," John Buckley (Ill. Cent.), Chairman.

The following officers were elected for the ensuing year: *President*, R. A. Mould (N. Y., L. E. & W.); 1*st Vice President*, John Buckley (Ill. Cent.); 2*d Vice-President*, J. E. Mick (B. & O., S. W.); *Secretary and Treasurer*, George F. Hinkens (St. P. & D.); *Executive Committee*, A. L. Woodworth (C., H. & D.); G. H. Judy (B. & S. Car Co.); W. W. McLelland (D. & R. G.); Milton Robbins (Fitchburg); G. W. Kelley (D., S. S. & A.); *Chemist*, James Kearney (C., B. & Q.).

Chicago was selected for the next place of meeting. The meeting then adjourned until the first Tuesday in September, 1897.

Convention of the Road Masters' Association of America.

The fourteenth annual convention of the Road Masters' Association of America was opened on Thursday, Sept. 8, at the Cataract House, Niagara Falls, N. Y.

The meeting was called to order for the first day's morning session at 11 a. m., about 70 members being present. President C. E. Jones delivered a short address of welcome.

The New and Improved Steel Frame Goodwin Dump Car.

In the *Railroad Gazette* of July 16, 1886, was described the first dump car made under the patents of the late John M. Goodwin; and in the issue of Dec. 6, 1895, a full description of the "New Goodwin Dump Car" (capacity 60,000 lbs.) was given, with drawings and figures showing its construction in detail. The Goodwin Car Company has during the last six months still further perfected its cars, and has been building them for actual service and exhibition purposes.

In the present issue are given five half-tone reproductions of photographs of their latest cars, which have been built materially in accordance with the drawings already given. They differ mainly in their carrying capacity for ore, iron and black cinder, this having been increased from 60,000 lbs. to 125,000 lbs. by the use of the new 5 in. × 9 in. journal described in the *Railroad Gazette* of June 26, 1896, and by the necessary strengthening of portions receiving the additional strain.

Fig. 1 shows a train of the new eight-wheel, side-dumping cars with a four-wheel car (No. 1,901) coupled on. The four-wheel car is both side and center-dumping; it was built in 1894, and has been in rough service ever since, having carried and dumped nearly every kind of material, such as ore, pig iron, cinder, shaly limestone and wet sand, without injury to itself or failure in dumping its load free every time. Fig. 2 shows the side elevation of one of the new eight-wheel cars in its carrying position. Fig. 3 shows the end elevation of one of the new eight-wheel cars, with the dumping and replacing levers. Fig. 4 shows the same car as in Fig. 3, but with the side valve hanging open after the car has been freed of its load. Fig. 5 shows a top view of an empty train, and the interior of the cars when ready for loading.

These side-dumping cars are especially designed for carrying ore, pig iron, cinder or any heavy material, but the Goodwin Car Co. have already completed the drawings for eight-wheel cars which dump from both sides and from the center, and which have been particularly arranged for the coal and grain trade. They are built entirely of steel, have full capacity for light material, and the steel floors and valves have been so perfectly joined as to make any leakage of grain impossible. An adjustable steel top has been designed for the grain service, giving protection against weather or theft, and a patent steel crate top brings the car up to the full capacity for coke. Full particulars regarding the cars of the Goodwin Car Co. can be had by applying at their New York office, No. 96 Fifth avenue.

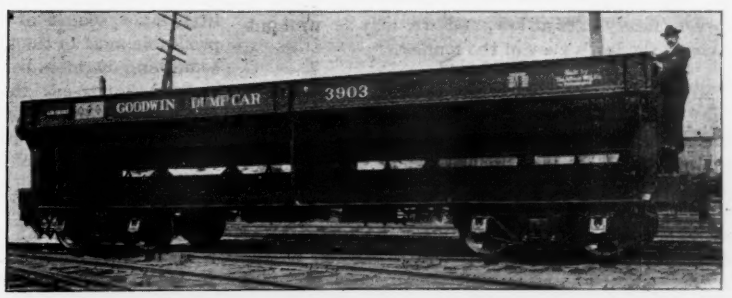


Fig. 2.—Goodwin Dump Car.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

In the train-accident records which we have published for the past 20 years we classify a disaster resulting from the breakage of a drawbar or coupling as attributable to "defects of equipment;" but a decision of a Virginia court reported in our Railroad Law column this week (ninth case) gives us pause, and we do not know but a charge of contempt of court may be hanging over us. The Virginia judge holds that an engineman running five miles with only part of his train, without knowing that it has broken in two, is probably guilty of negligence; and that the same is true of two brakemen on the rear portion who are near the front end of that portion (riding on a platform car, with one box car in front of them), and do not discover the trouble. Our report does not say whether the collision occurred at night or in the day time. If the latter, there is little doubt that the judge is right, and we only mention the case to remind the operating department that our classification, giving that department the benefit of the doubt in these cases, probably favors the train service a good deal in the course of a year. Quite likely a good many trainmen are punished, or ought to be punished, for collisions which we have charged to the manufacturers of couplings and draw-gear.

The next law-note, the tenth, is also of interest to the operating department, being a Texas decision on the flagging rule. It is safe to say that in this instance, as would be the case on nearly every road in the United States, the rule required the conductor to protect his train while taking water as well as at all other times. The decision shows the futility of depending upon mere *rigidity* to keep rules intact and effective. What the trainmen understand the rules to *mean* (without much regard to what the printed page *says*) is an important element when it comes to the question of responsibility for carrying them out. This should be remembered when censuring brakemen for disobedience of rules as well as when settling damage suits. The company's lawyer admits the principle because the court compels him to; but the superintendent might as well do likewise Still another law-note, the thirteenth, illustrates the same point. A brakeman who gets hurt by a defective deadwood when he might easily have taken warning from a plain explanation of its condition chalked on the corner of the car must be set down as rather thick-headed; but thick-headedness is a crime which is not punishable by very heavy fines at law, and we may as well put up with the law's view of the matter.

Mr. Baldwin, who has been appointed President of the Long Island Railroad, leaves the Vice-Presidency of a system 4,600 miles long, earning (gross) over 19 million dollars, to take the presidency of a railroad 367 miles long and earning about 4 million dollars. On the Southern Railway he was in direct and actual command so far as operating affairs go; he had a place of great power, and was in line of promotion to the highest office, and he is still young, only about 35 years old. Obviously, the inducement must have been considerable which led him to make the change. We have good reason to believe that the chief inducement is the chance to make a reputation in developing and improving the Long Island Railroad. To be sure, that property has not been mismanaged in the past. The present management has been in control 16 years. In the first 15 years of that control (the report for 1896 is not yet available) gross earnings had increased from $1,900,000 to a little over $4,000,000. Net earnings had increased from $226,000 to $1,421,000. Or, gross earnings had increased from $5,700 per mile to $11,000, and net earnings from $700 to $3,880. Fixed charges had increased from $363,000 to $917,000, and the results had changed from a deficit of $137,000 in 1881 to a surplus of $504,000 in 1895. This cannot be considered as an unsuccessful enterprise; and yet in quite recent years the business of the railroad has not increased. More passengers were carried in 1891 than in 1895; almost as many were carried in 1890. More passenger-train-miles were run in 1888 than in 1895. More freight was carried in 1892 than in 1895 and more freight-train-miles were run in 1891. The gross earnings were greater in 1891 than in 1895, and have been greater in every intervening year. We shall attempt no inquiry as to why the growth of this property appears to have ceased five or six years ago, but we venture to say that those who live along the line will speedily see the development of a new policy. We are quite confident that this is the purpose of the gentlemen who have selected an energetic, a young and an enthusiastic man to take actual, working charge of their property.

For press dispatches of genuine and pleasing rose-color we generally turn to the Northwest, where there is a fellow who seems to combine his fact and fancy in just about the right proportions to please the Press Association censor. This week he has got out a masterpiece, and without much labor; with none at all in fact, the substance of the item being furnished by a New Yorker who is well known for his ability in gilding sordid statements of dull business facts until they pass for poetry. This item (dated at Minneapolis) says:

"Erastus Wiman is in conference here with the millers over a plan to reduce freight rates on flour from Minneapolis to New York 10 cents. The route to be used includes the Erie Canal, and the plan is to take shape in the formation of the Consolidated Lake and Canal Company. The millers are to be given stock in this company, in return for which they are to guarantee enough flour shipments at a rate 10 cents below the present rate to insure a fair interest on the necessary investment. Canal boats especially built for carrying flour in packages are to be provided and free storage in New York—a necessary item to compete with railroads—is to be furnished, according to the plan, on a million-dollar tract of land provided by the city of New York. The millers look favorably upon the plan, as it insures a great saving in freight rates."

The present all-rail rate is, we believe, 25 cents (or less) per 100 lbs., from which it would appear that the promoters of the proposed new concern expect to be able to carry flour 2,500 miles at 15 cents per 100 lbs.; or, assuming that they mean 10 cents a *barrel*, at 20 cents per 100 lbs., equal to 1.6 mills per ton per mile. The rail rate is pretty low—Mr. Pillsbury has remarked that he can send a barrel of flour from his mill to New York for less money than it costs to send one to his own residence in Minneapolis—but if any one wishes to put up with the slower time and the additional handling by the canal-boat line, the boatmen will probably have full scope for their price-reducing talents. The most interesting feature of the report, however, is the statement that this beautiful scheme depends for its efficacy upon a gift of $40,000 a year (four per cent. on $1,000,000) from the city of New York. A gift of that amount is not to be despised, and we do not wonder that the millers "look favorably" upon Mr. Wiman's proposition. The last we heard, however, his application for the free storage tract (at 54th street on the North River) had not been favorably acted upon. The difference between asking for a thing and getting it is a point which does not seem to have been emphasized in the presentation of the scheme at Minneapolis.

But we do not mean to insinuate that the city will be so mean as not to give the canal-boat men this little favor, sooner or later. Boating has been unprofitable most of the time for the past few years and something ought to be done for them. What more natural than to ask the city for a lift? A favor to the boatmen would bring business to the city, and would strike at the vitals of Newport News, Boston and other ports which are stealing traffic from New York. The only suggestion we have to offer is that the city at the same time shall pay to the railroads a sum equal to the interest on the cost of the land and buildings which they use to store flour in. This real estate has cost many thousands of dollars and the railroads are paying, we presume, their full quota of taxes upon it. Probably the boatmen think that the city or state ought to assist them in getting business away from the railroads in the same way that it assists the electric street-car lines in a similar enterprise, that is by giving free use of terminals. In Philadephia the street lines were able to cut under the Reading railroad in suburban passenger fares partly because they did not have to bear the financial burden of a costly terminal yard. Of course, the city cannot forbid passengers to alight from a trolley car in the street, and the favor to the electric company is, in this respect, more apparent than real, but it offered a suggestion to the boatmen, nevertheless. When it comes to unloading flour by the 10,000 bbls., which must wait a month or two for a ship to carry it to Europe the question of free terminals takes on a different aspect. We understand that the experiment of sending flour to the seaboard by canal, which was tried this season for the first time in many years, was unsatisfactory chiefly on this account.

Railroad Rates and Farm Prices Again.

We wrote recently concerning Mr. Bryan's remarkable statement that "railroad rates have not been reduced to keep pace with falling prices," and we were obliged to think that Mr. Bryan spoke without sufficient regard for the facts in the case. We pointed out then that the general ton-mile rate for the United States fell from 1873 to 1894 nearly 57 per cent.; that the lake-and-rail rate on wheat from Chicago to New York had fallen 74 per cent., and the all-rail rate had fallen 63 per cent. For this comparison of rates we took the official figures of the United States Treasury Department. On corn the rail rate fell from 1873 to to 1895, 50 per.cent., and to 1896, 62½ per cent. On provisions the rate fell 50 per cent.

Since that writing we have received a copy of a pamphlet issued by the United States Department of Agriculture under date of July 24, giving average prices of 12 different crops and farm products, year by year, from 1866 to 1895 inclusive. Below are given a few of these prices. In this little table we have averaged the prices of 1871 and 1875 inclusive; also the prices of 1891 and 1895 inclusive. In each case these prices are in cents per bushel, except for hay and pork. The Department prices are in currency, but from values given by the Department we have converted these into gold as well, that being the only fair comparison. The table is as below:

	1871-5. Currency.	1871-5. Gold.	1891-5.	Declined per cent.
Corn	48.5	43.0	37.5	12 8
Wheat	112.1	99.4	58.2	41.4
Oats	39.9	35.4	29.0	18.1
Rye	78.9	70.0	48.5*	30.7
Barley	83.9	74.4	39.3*	47.2
Hay	$13.87	$12.30	$8.52*	30.8
Buckwheat	79.8	70.8	53.0*	25.3
Potatoes	59.3	52.6	46.4*	11.8
Mess pork	$17.32	$15.36	$13.46	12.3

* Three years only, viz., 1893, 1894 and 1895. Department records do not cover 1891 and 1892.

An interesting addition to this table is the following, compiled by Mr. L. B. Swift, of Indianapolis. This gives prices in Indiana, and these also are reduced to gold values:

	1873-77.	1878-82.	1883-87.	1888-92.
Corn, per bushel	35.6	41.8	37.0	39.8
Oats, per bushel	29.6	31.6	28.2	35.2
Wheat, per bushel	95.0	102.6	79.0	87.2
Rye, per bushel	62.8	70 4	57.6	68.0
Potatoes, per bushel	53 0	60 6	50.8	59.4
Hay, per ton	$9.31	$9.47	$8.41	$9.54

The most important of these crops in its aggregate value is corn, the value of which in 1895 was 545 million dollars. The decline in price seems to have been only 12.8 per cent. The crop next in importance was hay, the value of which in 1895 was 393 million dollars. The price of that crop had fallen 30.8 per cent. The value of the wheat crop in 1895 was 238 million dollars and the price of it had declined 41.4 per cent. The crop next in value was oats, the aggregate of which in 1895 was 163¼ million dollars. The decline in the price of this crop was 18.1 per cent. Barley, which shows the greatest decline, namely, 47.2 per cent., aggregated in value in 1895, 29½ million dollars. The potato crop was less in aggregate value than the crop of oats, but considerably more than that of barley, namely 79 million dollars. In this crop the decline was 11.8 per cent.

The potato crop is the most fluctuating of all, in value, although the acreage changes but little from year to year. In 1870 the average price was 72 cents, the year before it had been 53.5 cents and the year after it was 59.6. In 1875 it was as low as 38.9 cents, and the next year it had gone up to 67.2. In 1894 the price was 53.6 cents, and in 1895 26.6. In these years the acreage differed but little; that is, it was 2,738,000 acres in 1894 and 2,955,000 in 1895. But the yield was very different, namely, 170¾ million bushels in 1894 and 297½ million bushels in 1895.

Of course, the greatest factor of all in the general fall of crop prices ought to be apparent to anybody who will consider the statistics and who remembers

the conditions under which the crops are cultivated and gathered. The total acreage planted to corn in 1871 was 34 million, and in 1875 it had risen to a little short of 45 million; but in 1895 it was 82 million acres. The total acres of wheat in 1875 was 26¼ millions; in 1895 it was 34 millions. In this crop the acreage did not change nearly so much, but the economy of production has been immensely affected by the use of machinery; and furthermore, the price of wheat was affected by hte competition of Argentina, India, Southern Russia and India. As time goes on and the means of transportation and methods of agriculture are improved in those countries and in Australia their competition will probably be a still more serious element. The acreage sown to oats in 1875 was a little short of 12 millions and in 1895 it was almost 27 millions. The acreage in hay rose from 19 millions in 1871 to 44¼ millions in 1895. it is no wonder then that prices have fallen; the only wonder is that they have not fallen more.

Nobody denies that farmers have had hard times in recent years, and so have the rest of us. Surely no one regrets the hard times of the farmers more than the railroads and the bankers, for no one realizes more acutely than railroads and the bankers how essential to their own prosperity is the prosperity of the farmers. Setting aside any question of sentimental sympathy, the railroads and the bankers have a vital interest in the ability of the farmers to raise crops to be moved and to make money with which to buy all manner of products and to pay their debts.

New Railroads and "Public Convenience."

One of the very few States that has passed laws, empowering the Railroad Commissioners to prevent the construction of a new railroad, by refusing to grant a certificate, is Maine, and in that State the law applies to electric street lines as well as to standard railroads. A decision by the Maine Commissioners under this law will be found in another column of this paper. All judicial discussions of this subject are of interest now because the phrase "required for the public convenience," is somewhat elastic and liable to have different meanings according to the knowledge, temper or character of the men authorized to interpret it.

It will be seen that the Maine Commisioners place upon it a strict construction. The question whether or not the establishment of a high speed street railroad would be useful, between towns already connected by a standard railroad, generally depends chiefly on how well the cars can accommodate people by taking them and leaving them nearer their residences; and in the case of a highway well sprinkled with dwellings, with intermediate hamlets, it is often settled in the affirmative at the outset. The new road has an advantage in spite of its lower speed, and would have it even without increased frequency. But promoters are often ready to go a step farther and to establish a new street railroad for dwell ngs yet to be built. They act on precisely the same principle that is so familiar in the West, where, in the process of peopling the wilderness, the railroads have preceded the towns. There can be no doubt that new street railroads can quickly create business for themselves. It is just here that the Maine Commiss oners, following the Connecticut example, which they cite, step in and draw the line. Public convenience may at some future time need a new street-car line, but it does not now, and so the law is held to forbid the use of the street for such purpose.

Whether, in case of a crowded city like London or New York where, theoretically at least, thousands of people are suffering inconvenience, because they are unable to avail themselves of cheap suburban homes, the view taken by the Maine Commissioners would be equally sound, might be a delicate question; on this they give us no light.

We do not know what degree of enlightenment prevails among municipal officers in Maine, as regards the policy of towns and cities toward street railroad companies asking new and extensive privileges, but unless it is much higher than the average in other states the decision in the present case is undoubtedly just. Railroads which are built for heavy freight trains and fast expresses and, therefore, cannot accommodate every man at his own door step, must inevitably suffer from the competition of light cars, which can be rapidly and cheaply propelled up steep grades and around curves of 50 ft. radius; but the least the public authorities can do is to see that the competition is not made unfair by unequal privileges and burdens. The street railroad has, in its right of way, a great privilege, and it is the duty of the public officials to see that in the adjustment of the taxes of these new competitors of the steam railroads this great advantage shall be compensated for. A corporation which has at enormous expense provided a railroad for the freight and the long-distance passenger traffic of a town cannot justly be deprived, without a hearing, of the revenue which was counted upon, when the railroad was built, to support it. It would be interesting to learn the effect on the Westbrook-Gorham application of compelling it to acquire its own right of way. How anxious would the projectors be to build in that case?

Annual Reports.

Chicago, Milwaukee & St. Paul.—The report of the St. Paul for the year ending June 30, 1896, is for 6,153 miles operated. No extensions of the company's lines have been made during the year.

The results of operation for the last four years may be compared in the following table:

Earnings:	1893.	1894.	1895.	1896.
Freight	$25,722,001	$21,550,687	$18,978,263	$23 887 930
Passengers.....	7,511,757	7,311,822	5,852.781	6,147,679
Mails, express, etc.....	2,509,671	2,465,442	2,504,325	2,646,220
	$35,743.429	$31 327,951	$27.335,369	$32,681.829
Expenses	23,712,943	20,114.333	17 043,753	19,676,808
Net earnings....	$12,030,486	$11,213.618	$10 291,616	$13,005.021
Miles in operation	6,108.92	6,147.08	6,159.35	6 153 27

The ton-miles increased from 1,765 million in 1895 to 2,382 million in 1896, but the ton-mile rate fell from 1.075 cent to 1.003. The train load increased from 152.16 to 167.08 tons. We see from the above that while the freight earnings increased 25.87 per cent., the traffic measured by ton-miles was 34.92 per cent. greater than in the year before.

The passenger earnings increased in the year 5 04 per cent. The passenger miles in 1895 were 244½ millions; in 1896 they were 261 millions, the increase having been 6.8 per cent. The passenger rate, however, fell slightly; that is, from 2.396 cents to 2.357 cents. Notwithstanding the fall in rate, the revenue per passenger train-mile increased somewhat; that is, from 75.25 cents to 76.55 cents. Considering all the traffic, the percentage of operating expenses, including taxes, was 60.21 in 1896, 62.35 the year before and 64.21 in the year before that.

The expenditures on maintenance of way and structures were increased over the preceding year by 18 per cent. and aggregated 4¾ millions. For maintenance of rolling stock the increase was 40 per cent. and the aggregate nearly three millions. For conducting transportation the increase was 9 per cent. and the aggregate over nine millions. The increase of $671,000 in the item of maintenance of way and structures is made up principally of increase in repairs of track and repairs of buildings. Still the new steel rails laid and accounted for under the renewal of rails amounted to 22,480 tons, an increase of 6,287 over the year before. For repairs of bridges the expenditure in 1896 was over $800,000, the increase being nearly $141,000. This item includes the total cost of 56 iron bridges, aggregating 5,573 ft. in length, to replace an equal number of wooden bridges, and includes also the filling of about four miles of pile bridges with earth and the replacing of 247 wooden culverts with iron.

In maintenance of rolling stock the increase for the year was $857,000. This includes $363,000 charged to repairs of locomotives and cars to replace the loss of equipment during the year, also general repairs of 361 locomotives and 14,233 cars. Out of the rolling stock replacement fund, which appears as one of the items in the general account, 11 locomotives were purchasod and 575 box cars, the whole costing about $360,000. There is an unexpended balance of this fund now amounting to $258,000. The sum of $388,000 has been expended for new rolling stock and for airbrakes and automatic couplers and other improvements to rolling stock, and charged to capital account. Of this, $264,000 was spent for brakes, couplers "and other improvements."

The capital stock now amounts to $72,923,161, having been increased during the year by $739,000 in preferred stock issued in exchange for the same amount of convertible bonds cancelled. The funded debt of the company is now $139,161,000, having been decreased during the year by $160,000. This was a net decrease, $579,000 of general mortgage 4 per cents. having been added for additions and improvements to the property and $183,000 general mortgage 4 per cents. having been issued in exchange for underlying bonds cancelled; but, as mentioned above, $739,000 of convertible bonds was exchanged for preferred stock and cancelled.

The increase in wheat carried during the year amounted to 356,000 tons, the tons carried having been 1,092,000. This was nearly 9 per cent. of the total freight movement of the road. The increase in tons of oats carried was 235,000; the total having been 537,000, amounting to nearly 5 per cent. of the tonnage of the road. The barley carried was 5½ per cent. of the total tonnage, namely, 671,000 tons. In this the increase was less than in wheat and oats. The total tons of all agricultural products carried amounted to 3,846,000 and the increase over the previous year was 37.63 per cent. Agricultural products made up 31.5 per cent. of the total tonnage as against 26.68 the year before.

It is obvious that the increase of revenue from freight was due principally to the increase in tonnage of agricultural products in consequence of good crops and to the increase of 26.56 miles in the average haul of freight Coal, which was 13 3 per cent. of the total tonnage of the road, increased but about 45,000 tons, and lumber actually decreased. A table is given showing that the ton-mile rate year by year from 1867 down In that year it was 3.94 cents and in the year ending June 30, 1896, it was 1,003. This was the lowest rate ever touched except in 1890, when it was 0.995 cents, and in 1891 when it was also 1.003.

Chicago Great Western.—The annual report for the year to June, 1896, shows gains over previous years in several ways. Earnings have increased, though they are not yet as large as in 1892 and 1893; traffic is moved more economically and improvements have been carried out during the year, in reducing grades, ballasting, widening cuts and embankments, building new bridges and buildings, etc.

The result of the traffic operations is summed up in an increase of gross earnings of 29.5 per cent., an increase in operating expenses of 17.5 per cent., and an increase in net earnings of 70.8 per cent. Earnings have benefited chiefly from a larger freight revenue, the gain over 1895 on this item being $963,000, or 37.3 per cent., the total revenue from freight being $3,543,096 The passenger earnings were $972,066, an increase of $134,994, or 16 per cent.

The increases in operating expenses were: In maintenance of way, $164,018 (34.20 per cent.); in maintenance of equipment, $111,789 (26 61 per cent.); in outside agencies and advertising, $45,271 (32.67 per cent.); in general expenses, $13,221 (4.56 per cent.), and in cost of conducting transportation, $159,193 (10.69 per cent.).

The general results of earnings and expenses for four years are as follows:

	1896.	1895.	1894.	1893.
Earnings.....	$4,709.821	$3,636,099	$4,011 710	$5,024.740
Expenses.....	3,310,243	2,816 749	2 882,897	3,661,677
Net.....	$1,399,578	$819.350	$1,128,813	$1,360,063
Gross, per mile..	$5,079	$3,912	$4,349	$5,447
Net, " " ..	1,509	888	1,224	1,474
P.c. exp. to earn	70.2	77.4	71 8	77.8
Freight carried.	1,376,579	.....	1,233,523	1.588,598
Pass'rs carried..	1,034,761	.....	1,007,277	1,161,651
Rate per ton-mile	2.57 cts.	.....	2.24	2.35
" " pass. "	2.14 "	.....	2.03	2.25

Complete traffic statistics were not kept in 1895, so that for that year we have neither the ton-mile or passenger-mile rate nor the freight or passenger miles. The ton miles do not appear to be given in the report.

The operating expenses are classified in the following table:

	1896.	1895. Inc. or dec.	P. C.
Conducting transportation	$1,648.233	$1,489 039 I. $159,193	10 6
Maintenance of way.....	643,538	479,520 I. 164,018	34.2
" of equipment	531.859	420,070 I. 111,789	26.6
Agencies, commissions and adv.....	183,845	138,573 I. 45 272	32.6
General expenses.....	302,7o8	289,547 I. 13,221	4.5

From these two tables it will be seen that the gross earnings have increased $1,073,000, with an increase of but 10 per cent. in the cost of transportation. Moreover, there was an increase of 761,000 in train miles run. The increase shown in cost of conducting transportation represents an increase of but 20.9 cents per train mile for the extra train mileage necessary to move the greater traffic, a figure which shows that economies in moving traffic have been very closely looked after. This will be shown more clearly by giving the average earnings per freight and passenger train mile, the average cost of constructing transportation per train mile and the percentage of the cost per freight and per passenger train mile for six years.

	Earn. frt. train mile $	Earn. per pass. tr'n mile. cents.	Cost transp. per train mile cents.	P. c. cost per frgh't train mile	P. c. cost per pass. train mile
1896.....	1 82	.607	.43	23.6	70.8
1895.....	1 86	.590	.485	26.0	82.2
1894.....	1.55	.847	.496	32.0	58.3
1893.....	1.28	.870	.520	40.0	59.7
1892.....	1.31	.978	.505	38 0	55 5
1891	1.17	.880	.47	40.0	53.4

Pursuing the policy which the directors outlined a few years ago, that the best way to build up the local towns and the passenger traffic on a new line is by frequent passenger service, involving the running of many trains steadily without a profit, and often at a loss for a while, the passenger service has been further increased and improved in the last year. The passenger-train mileage has been increased 207,158 train miles and the passenger-train earnings (including passenger, mail and express) have increased $148,137, equal to 71½ cents for each extra train mile. But even these results have cost much effort and a large increase in expenses, particularly soliciting and advertising. The report shows that "outside agencies" cost $114,958, or 27.9 per cent. more than in 1895; advertising cost $57,000, or 73 per cent. more, while commissions paid were $11,787, a decrease of 25.5 per cent.

It will be noticed that the largest percentage of increase in expenses was in the maintenance of way, 34 per cent. The construction and improvement expenditures paid out of earnings in the 12 months were $227,000 roughly. The expenditures on this account, charged to the special fund provided Dec 7. 1895, were $219,000, This included $40,000 for bridges and culverts, $42,000 for equipping cars with air-brakes and couplers, $11,000 for equipping through passenger trains with steam heat and $28,695 for eight new coaches. The total amount provided for improvements by this special fund was $652,000, of which $432,000 remains as an unexpended balance.

Federation of the different railroad brotherhoods, a subject which seems always to have a great fascination for the reporters, has been frequently exploited in the the press dispatches of late. One report (that of a meet-

ing at Indianapolis) states that a resolution in favor of federation was passed, and that there would be a strong movement to have action taken by the grand lodges; and that Mr. Arthur favored it. The only basis for all these propositions is the desire of the conductors, brakemen and firemen to get themselves into closer relations with the enginemen, the brotherhood of the latter being more powerful than all the others put together. The trouble with the press dispatches is that they represent the movement as national, whereas there is not, at least so far as the enginemen are concerned, the least sign of action in this direction. Only on individual railroads or systems has anything been done. For several years the rules of the Brotherhood of Locomotive Engineers have authorized the members on any one road to federate with the other brotherhoods on that road whenever two-thirds of the members were in favor of it. The vote at Indianapolis simply expressed the feeling of the persons present. One of the alleged facts given, to show that the enginemen are favorable to the federation with the other brotherhoods, was their loss of membership since the Debs strike; but it does not appear that that loss was very serious or that the strength of the B. L. E. has appreciably declined.

Convention of the Road Masters' Association of America.

(*Continued from page* 639.)

greatest service. It prevents the tie from being cut into by lessening the up and down motion and decreases the lengthwise movement with the result that there is less creeping of rail and little or no wear into the tie, if the tie plate is properly imbedded.

The third connection of the tie plate is the spike. . . . To accomplish perfect spiking the tie plate should have its holes so punched as to allow a close fit of the spike to the rail flange. Where this is not done trouble is experienced in the wear of the parts due to the working in and out of the rail against the spikes. This in connection with the up and down movement causes a wear in the neck of the spike. It is therefore most essential that tie plates should be properly punched, and no tie plate should be placed in position unless the tie has been adzed to a true bearing, as we find the principal cause of tie plates buckling has arisen from this neglect, for no tie plate can be a bridge. In connection with this last finding the committee have been struck with the fact that many of the tie plate manufacturers are placing a shoulder on the plate, and that said shoulder as now used is of little or no value, for when the spike wears the rail gets loose motion and the shoulder and spike both cut. To the mind of your committee it appears if this shoulder were placed the full width of the tie plate it would offer a support for and reduce the strain on the spike with consequent and better results in the line and gage of the rail. . . .

The consensus of opinion seems to be that the life of the cedar tie averages 12 or 14 years, hemlock ties five years, tamarack ties six years and oak ties nine years. . . . In all the reports we have received the invariable answer has been that where the tie plate has been used it has prolonged the life of the timber from mechanical wear. Furthermore, your committee find that better results have been obtained from a narrow than a wide tie plate, and feel that a plate 5 in. wide is ample for all purposes.

On the second division of the subject matter, to-wit: "Will the Use of Tie Plates Dispense with the Use of Rail Braces?" your committee, after a most thorough and searching experiment and investigation, unhesitatingly state they will do so. We have received reports showing where they have proved successful on curves of 3 degrees and 30 minutes, 4 degrees and 25 minutes, 15 degrees, and even on 60 degrees, where they have held the rail in place without any rail braces being used. Moreover, no lateral movement or cutting of ties has occurred on these curves, and the track is in perfect and true gage. . . .

Your committee all unite in recommending the general use on all repair and construction work of the tie plate, and feel that its added cost to the track maintenance will be more than compensated by the cost of labor saved in tie renewals alone.

B. Black, *Chairman.*

The discussion which followed was divided under four heads in accordance with the findings of the committee in the report:

First, that tie plates hold to the gage. With one or two exceptions, the testimony given by the members under this heading was, that in their experience this finding was correct, the greatest efficiency of the tie plates being on curves and in railroad yards.

Second, they prolong the life of the tie. The opinion was universal that where the plates were used the ties lasted longer than without them. Mr. Hawkins explained one great reason to be that the tie plates obviate the necessity of re-spiking, and therefore do not cut up the tie. All the members agreed that this preserving effect was much more marked in ties of soft wood than of hard.

Third, they are invaluable on curves. This finding was accepted without any discussion.

Fourth, gives better support and a backing to the spike. A considerable discussion took place as to whether or not a shoulder in the tie plate was an advantage. Mr. Dodson says it has been his experience that they are of no advantage. Mr. Shanks has found that they keep the rail from cutting off the spike heads. He has 8,000 now in service and finds them very efficient in this regard. Mr. Hawkins is of the same opinion as Mr. Shanks. Mr. Stickney thinks an 18-deg. curve unsafe without a shoulder on the tie plate. Mr. Coates cited an incident which happened five years ago, on the Wheeling division of the B. & O.; the rails spread on account of wide punching of the plates, but the trouble stopped with the use of a shoulder tie plate. A vote was taken in regard to the proper length of the shoulder, and all but seven members believe that it should equal the width of the plate. Some discussion then arose on tie plates versus rail braces, the majority of the members agreeing with the committee that "the use of tie plates will dispense with the use of rail braces." Mr. Collins substituted tie plates for rail braces on a 10-deg. curve, the braces having allowed the rails to spread; he found that the tie plates obviated this trouble.

On motion of Mr. Hawkins, it was voted that the entire report of the committee be accepted and ratified by the association, with the amendment that the use be recommended of a shoulder extending the entire length of the tie plate.

The session adjourned at 5 p. m.

Report of the Committee on Elevation of Curves.

Your committee recommends the use of the formula: Elevation $= \frac{gv^2}{32.2R}$, in which g equals gage of track in feet, v equals velocity of train per second in feet and R equals radius of curve in feet. The following table computed by this formula shows the elevation in inches for each curve, 1 deg to 10 deg., and for speed of 10 to 70 miles per hour, inclusive.

We are of the opinion that curves should be elevated for the highest speed at which passenger trains usually run over them, limited, however, to an elevation of about 7 in. if the track also carries freight traffic. If exclusively passenger traffic we would not be limited to 7 in. if the circumstances seemed to require more.

We recognize the various conditions that may require a modification of this rule. In such cases each will be governed by the prevailing circumstances, bearing in mind that the passenger traffic deserves more consideration than freight.

At the proper speed for which the curve is elevated each rail carries equal weight, in other words, a weighted line through the center of gravity of the car will remain perpendicular to the plane of the rails while passing the curve.

Table of Elevations for Curves 1 *deg. to* 10 *deg., for Speed of* 10 *to* 70 *miles.*

Degree of curve.	Miles per hour.							Remarks.
	10 miles	20 miles	30 miles	40 miles	50 miles	60 miles	70 miles	
1	1/16 in.	1/4 in.	5/8 in.	1 in.	1 3/8 in.	2 1/8 in	3 in.	Maximum elevation about 7 in. by the formula elevation equals $\frac{gv^2}{32.2R}$.
2	1/8 "	1/2 "	1 1/4 "	2 "	2 3/4 "	3 3/4 "	5 "	
3	1/16 "	3/4 "	1 7/8 "	3 "	4 1/8 "	5 1/2 "	7 "	
4	1/4 "	1 "	2 1/2 "	4 "	5 1/2 "	7 "		
5	5/16 "	1 1/4 "	3 1/8 "	5 "	6 7/8 "			
6	3/8 "	1 1/2 "	3 3/4 "	6 "	8 1/4 "			
7	7/16 "	1 3/4 "	4 3/8 "	7 "				
8	1/2 "	2 "	5 "	8 "				
9	9/16 "	2 1/4 "	5 5/8 "	9 "				
10	5/8 "	2 1/2 "	6 1/4 "	10 "				

When trains pass curves at a speed greater than the track is elevated for, the weight on the outer rail is increased, flange friction is increased and the tendency to turn the outer rail over is much greater, but we believe in full elevation, because it is not only safer, but a much better riding track, and the advance in the condition of track and increased average speed require greater attention in this matter.

Where no easement curves are used we recommend full elevation at ends of curves, running it out on tangents at rate of 50 ft. per inch. It is unnecessary to add that uniform elevation, good line, gage and surface are as essential as the proper elevation for a perfect track.

We are decidedly in favor of easements for all curves of 2 deg. and over. They make the entrance to curves gradual, reduce in shock at high speed, and keep the line much better. They should be put in with a transit and should be of sufficient length to carry all the elevation at the rate of about 50 ft. per inch. That is, the elevation should begin with the easement and reach full elevation at beginning of regular curve. The spiral or cubic parabola is equally good.

Where they are not put in by the engineer good results can be obtained by throwing the whole curve in a given distance and flattening the ends by extending the curve beyond the ends of the original curve equal to one-half the length of easement. To get easement of a certain length as the curvature increases the amount the original curves move in will increase. Thus for easement of 150 ft. on 2 deg. curve the inset will be 4 in.; for 225 ft. on 3 deg. curve the inset will be 1 ft. 1 in.; for 300 ft., 4 deg. 2 ft. 7 in.; for 350 ft. on 5 in. curve, 4 ft. 5 in., etc.

G. Davis, B., C. R. & N., *Chairman.*

Frogs and Switches.

For main-line work we would recommend spring rail frogs not less than 15 ft. in length, and in yard work, wherever practicable, would suggest the use of spring frogs of not over 12 ft. in length. . . . Where a rigid frog is adopted for such work with a heavy traffic, a bolted and filled frog with 3/4-in. steel plates is preferable and more economical. . . .

The clamp frog may be utilized to advantage in main line service where traffic is light; the great objection, however, to this class of frog is its inability to support itself; . . . the point dropping below the surface of the wing rails. . . . The only advantage gained in the use of the clamp frog is that when one wing rail is worn it admits of the frog being transposed, or it may remain in its former position, and a new wing rail be substituted at a small cost, thus prolonging the life of the frog. In yards where a large number of switches and frogs are necessary this style of frog cannot be used to good advantage on account of the long ties.

In yard work where sharp curves are necessary would recommend a frog 12 ft. in length; owing to the fact that frogs placed in curves of low radius require a wider throat and flangeway, consequently the space from outside of guard rail to point is greater in order to allow the wheel flange to pass through without binding, overcoming the battering and pounding down of the entire frog. . . .

While spring frogs in yard construction may or may not be as economical as the bolted and filled frog, we do not consider it good policy to make a general use of them in freight yards where a great amount of switching is required, as switchmen are more or less liable to have their feet caught in the frog.

The objection to the double, rigid frog, as usually made, is that the wheels are furnished with no guard in passing from one point to the other. In order to overcome this difficulty it is well to have the guard rail of the frog so made that it will shade both points one-eighth of an inch; in this manner one frog will answer as a guard for the opposite frog while trains are passing through the combination. Rigid double frogs up to one in seven can be used on combinations of 8 deg. and 10 min. In combination switches above 8 deg. and 10 min. we would recommend the use of movable point frogs.

We wish to call your attention to a guard rail as shown in blue print No. 1. [Not received.] You will notice that two clamps are made use of on either end which hold the rail rigid and overcomes the possibility of the rail turning over. The two bends in either end have a tendency to crowd the wheels gradually through the frog, preventing them from striking the point, reducing to a minimum that sudden shock which would otherwise be the result in the use of an ordinary guard rail.

For main line passing tracks a one-in-eleven spring frog is recommended.

Since the adoption of the interlocking system at railroad crossings, allowing trains to pass at full speed, the expense is consequently materially increased, requiring as they do a greater amount of care and attention as a matter of perfect safety. Thorough inspection should be made each day of such high-speed crossings and any defects found to exist the necessary remedy should at once be applied. . . . A railroad crossing should be placed in such a manner as to be perfectly rigid and the least expense will be incurred in the maintenance of such a crossing. In order to accomplish this it is advisable, if the circumstances will admit, to have at least four feet of rock foundation framed with timbers of suitable kind and size, and a properly constructed drain from the bottom of the pit, and if properly built, with constant use, can be cared for the year round at no great expense of maintenance. The gage of railroad crossings on tangent should be 4 ft. 8 1/2 in., with 1 3/4-in. flange-ways placed on three-quarter-inch steel plates, made in proportion to the angle and area of the crossing. . . .

Switches in main tracks should be put in with a theoretical lead corresponding with the theoretical switch point, in accordance with the angle of the frog, and where a 15-ft. switch point is used, as is very often the case, the length of the lead should be shortened the difference between the theoretical switch point and the 15-ft. point, which will make the lead practicable. . . .

All switches should have a 5-in. throw as they are more economical to keep in repair and also do away with that element of danger caused by wheels catching the open point. . . .

It is very essential to have a suitable guard rail placed 4 ft. 6 5/8 in. from the point of the frog, regardless of the gage of the track. Two tie rods on all yard switches are also recommended with a stop block on the stock rail; stock rail should be bent 9 in. ahead of the point. A kink in the stock rail ahead of the point all the way from 15 to 20 in. is often made use of. The objection, however, to this method of construction is that it permits worn or double-flanged wheels to run in the space between the point and the stock rail, as the only part of the point that sets up against the stock rail is just near the point of the switch.

All main-track switches should be made with reinforcement bars connected to the points, in order to bold them securely in position should they become broken, and thereby prevent in many instances a serious derailment. James A. Lahey, *Chairman.*

Ballast.

Ballast made from stone, crushed to the proper size for tamping, that will neither solidify in track nor disintegrate while being worked, makes the best ballast. We have seen gravel in small quantities, generally in pockets, that was clean, hard stone, ranging in sizes from that of a pea to a hulled walnut. No material could be better for ballast than this, but, owing to the amount of soil and fine sand that is usually put in track with the gravel, we find it inferior to crushed stone.

There is no doubt that burned clay has many qualities to recommend it for ballast. Those who have used it the longest are the most enthusiastic in its praise. Furnace slag makes very good ballast, and the same may be said of locomotive cinders under certain conditions.

The methods of handling ballast differ under different conditions and localities. . . . Where it is convenient to locate the crusher about level with the quarry, parties who move the stone with dump carts claim that they can do it more economically than with cars. . . . The distribution of crushed stone on track can best be done with hopper-bottom cars. The Roger Ballast Car is perhaps the most complete car for this work that is in general use. Gravel can generally be more economically loaded with steam shovel than in any other manner. It can best be handled in hopper-bottom cars also, or may be distributed with good success on flat cars, when the haul is not too long, and unloaded with the rapid unloader. W. H. COURTNEY, *Chairman.*

EXHIBITS.

Bond Steel Fence Post Co.—Steel fence posts and signa posts.

The Buda Foundry and Manufacturing Co., Chicago.—A standard section hand car; a velocipede car; two Paulus track drills, one with light base and one with heavy; track jacks and track gages.

The Continuous Rail Joint Co., Newark, N. J.—American Society rail sections, 60 to 85 lbs., inclusive, and full-size joint B. & O. R. R., Am. Soc. 85-lb. rails.

Dilworth, Porter & Co. (Limited), Pittsburgh, Pa.—The "Goldie" spike and the "Goldie" claw tie plate.

Eyeless Tool Co., New York.—Samples of their eyeless solid steel picks.

Elliot Frog and Switch Co., East St. Louis, Ill.—Models of steel clamp frogs; Eureka spring rail frogs; three-throw split switch with "hasty" combination stand.

Fairbanks, Morse & Co., Chicago.—Barrett track and bridge jacks, Fairbanks' track drill; new Sheffield 24-in. pressed steel wheels; set of cut gears for Sheffield hand cars and velocipedes; plans of water stations, etc.; Sheffield Nos. 1 and 2 hand cars, with side seats; Sheffield cattle guard; Sheffield velocipede; Sheffield velocipede motor car and four-wheel velocipede.

Wm. Goldie, Jr., & Co., Pittsburgh, Pa.—The Goldie tie plug.

Hussey, Binns & Co., Pittsburgh, Pa.—A number of shovels.

The International Correspondence Schools of Scranton, Pa.—Books and papers showing their method of teaching railroad engineering.

The Jones National Fence Co., Columbus, O.—Samples of wire fence showing method of locking the wire.

The McMullen Woven Wire Fence Co.—Samples of McMullen's standard railroad fencing.

National Jack Co., Boston, Mass.—Pearson car-replacing jack.

The National Lock Washer Co., Newark, N.J.—A number of their nut locks.

National Switch & Signal Co., Easton, Pa.—Two train staff instruments; one regular four-lever interlocking machine; Patenall lock and block.

The New York Fence Co., Syracuse, N.Y.—Sample of wire fencing.

A. O. Norton, Boston, Mass.—Several sure drop track jacks.

Page Woven Wire Fence Co.—Samples of their coiled spring woven wire fence.

Pennsylvania Steel Co.—One long safety switch stand, high pattern; one long safety switch stand, low pattern; one positive switch stand, "The Pet."

Pettibone, Mulleken & Co., Chicago.—The Jenne track jack, pattern 1891, and Alkins rail brace.

Positive Cattle Guard Co., Chicago.—Full-size cattle guard.

Q & C Co., Chicago.—Samples of Servis tie plate and statement of number in use on different roads.

Railway Cycle Mfg. Co., Hagerstown, Ind.—Two full-size, four-wheel inspection cars, one with single seat, 53 lbs., and one with double seat, equipped with gasoline motor attached, weight 95 lbs. complete; both are equipped with their new bearing system.

Railroad Supply Co., Chicago, Ill.—The Wolhaupter arch and girder tie plate. Eight samples of the plate in ties of oak, cedar, California red wood, showing the bedding qualities of the plate in different woods, preservation of the tie, the compression of fiber by the arches of the plate. Tie plate and spikes shown, as reported by R. W. Hunt & Co., taken from 6 deg. 30 min. curve at the Union Depot yard in Chicago. Plates and spikes in use 14 months on oak ties and had an average of 250 trains a day passing over them.

Ramapo Iron Works, Hillburn, N. Y.—Models of switches, frogs and crossings and switch stands; also brake shoes, etc.

Ruffner & Son, Philadelphia.—Nut locks or fish plate springs.

Roberts, Throp & Co., Three Rivers, Mich., represented by their general sales agents, C. H. McKibbin & Co., New York—The Cyrus Roberts patented hand cars and the Green safety railroad switch, frog and guard-rail block.

Safford & Moore Railway Jack Co., Chicago, complete display of track and bridge jacks, with tripping arrangements; also jack for setting tie plates.

Truss Rail Joint Co., Chicago, H. H. McDuffee, General Sales Agent.—Number of truss rail joints.

Union Switch & Signal Co., Swissvale, Pa.—Electric automatic signals.

Verona Tool Works, Pittsburgh, Pa.—Track tools, the Cunningham ratchet track wrench, etc.

Weber Railway Joint Manufacturing Co., New York.—Insulated joint, joint from Manhattan Railway in service for four years after rail had been in use nine years previously; compromise or step joint; 9-in. girder rail joint, 6-in. girder rail joint, 7-in. tee rail joint and joints in parts.

The Wharton Railroad Switch Co., Jenkintown, Pa.—Switch clips, adjustable keyless frog yokes, switch plates, etc.

TECHNICAL.

Manufacturing and Business.

Edward H. Power, General Eastern Sales Agent of the Interchangeable Brake Beam Co., of St. Louis, has removed his office from the Potter Building to Suite 40, of the Equitable Building, New York.

The contract for the boilers of the new open-hearth plant to be erected by the Buhl Steel Co., Ltd., at Sharon, Pa., has been given to the Oil City Boiler Works, of Oil City, Pa. The boilers will be eight in number, each of a capacity of 250 H. P. and will be of the Geary water-tube style. The contract is for furnishing them set up complete, including brick work, smoke connections and stacks.

The Detroit Sprocket Chain Co. has been organized with an authorized capital stock of $25,000. The officers of the new concern are Theodore D. Buhl, Chairman; Thompson H. Simpson, Treasurer; L. B. Ball, Secretary and Superintendent. A plant will be established at Detroit to make link belting, malleable iron buckets, sprocket wheels and elevating and conveying appliances. L. B. Ball has for the past three years been Secretary of the Chain Belt Co., of Milwaukee, and will have active charge of the Detroit company. Chairman Theodore D. Buhl is connected with several companies in Detroit and the Treasurer, Thomas H. Simpson, is Treasurer and Manager of the Michigan Malleable Iron Works.

The offices of the Colliery Engineer Company, proprietors of the *Colliery Engineer*, *Home Study* and the International Correspondence Schools at Scranton, were partially destroyed by fire on Aug. 30. Fortunately, the printing plant was in another building and reserved supplies for the schools in a third building, so that no serious interference to the business of the company will result. Three floors of the new Mears Building in Scranton have been secured for offices, instruction has been resumed in the schools as usual, and the publications of the company will be issued this month, with only a few days' delay.

New Stations and Shops.

The Baltimore & Ohio occupied its new machine shops in South Cumberland, Md., Sept. 1. The plant includes a 44-stall roundhouse 360 ft. in circumference, with a double-track entrance. The improvements cost about $340,000.

Iron and Steel.

A set of rolls for 18-in. beams have recently been put in at the Homestead Steel Works, at Homestead, Pa. Heretofore no size between 15 in. and 20 in. has been rolled at these works.

Soho furnace, of the Pittsburgh Iron and Steel Manufacturing Co., has been blown out and is being relined. It will be ready for blast again within a short time.

The steel plant of the Shenango Valley Steel Co., at New Castle, Pa., has resumed operations after an idleness of several months.

Every mill in the steel department of the Edgar Thomson Works of the Carnegie Co., at Braddock, Pa., suspended operations indefinitely on September 3. Lack of orders is said to be the cause for the suspension. It is reported that six of the seven furnaces now in blast at the Carnegie Co.'s plant will be banked in a short time.

THE SCRAP HEAP.

Notes.

The Baltimore & Ohio Southwestern has taken its dining cars out of the hands of the Pullman company, and hereafter will operate them directly.

The Railroad Commissioners of South Carolina have recommended to the Southern and the Charleston, Cincinnati & Chicago that they build a union station at Rock Hill; and to the Atlantic Coast Line, the South Carolina & Georgia, and the Florida Central & Peninsular that they build a union station at Denmark.

Near Webster, Cal., nine miles from Sacramento, on the night of Sept. 5, an express train of the Southern Pacific was flagged by three masked robbers. Upon seeing what was the matter, the engineman shot and killed one of the robbers. The other two escaped, in some way which is not clearly explained, but the train was soon started and reached the next station in safety. The dead body of the robber who had been shot was found the next morning.

Reports of retrenchment on railroads continue to appear. The Central of New Jersey has discharged men at various points, and the Philadelphia & Reading has reduced forces in shops. On the Belvidere Division of the Pennsylvania a number of track walkers have been suspended or discharged. The Northern Pacific has made extensive reductions, in some cases as great as 33 per cent., though it is not stated whether the reduction is in force or in wages. The Wabash has announced that hereafter shopmen working overtime will be allowed only regular wages for the extra hours instead of "time-and-a-half" as heretofore.

The Cartagena-Magdalena Railroad Dispute.

The despatches from Panama last week have given some account of a disagreement between the local manager of the Cartagena-Magdalena Railroad and the Colombian government, and late despatches stated that the manager was under arrest and the road seized by the government. The truth of these reports of extreme measures have not been verified. The dispute between the government and the officers may be briefly stated as follows: The railroad is operated under two concesssions, one covering the 65 miles of road from Cartagena city to the Magdalena River, about the freight rates on which there is no dispute with the government. From Cartagena to the railroad wharf there is what is called the Terminal Railway, which is about six-tenths of a mile long, and operated under a separate concession. The whole road is, of course, operated as a unit, as a large part of the traffic is in through goods which come from the river directly to the vessel's side at the wharf, and *vice versa*. The maximum rates which are allowed to be charged for the transportation of freight and passengers are limited by the company's concessions. The present dispute with the government has arisen over the question of whether the word "ton" in the concession means the ton weight or the ton "weight or measurement." The practice of the railroad is to charge by "weight or measurement." The fiscal code of Columbia defines the ton as 1,000 kg., or one cubic meter, and the universal practice of all freight carriers in Columbia, is to charge freight by "weight or measurement." Some of the Cartagena merchants have been endeavoring to force the company to charge by weight only, and the company has declined to do so. The merchants have appealed to the government, and from the dispatches it would appear that the government has decided against the company and in favor of the merchants. If it is true that the government has so decided, there is then a difference of opinion between the government and the company as to the interpretation of its concession, and by one of the clauses of the concession it is provided that differences of opinion shall be settled by a board of arbitration. The company's officers in this country state that they have found the Colombian government always inclined to live up to the letter and spirit of its concession, and there is no fear but that it will do so in the present case.

Since writing the above telegraphic advices have been received by the company's officers in this country, which show that the situation is serious and that the government is not living up to its obligations under the concession. The manager is not under arrest, as the press despatches state.

Lake Notes.

James Davidson, of Bay City, will soon lay keels for two or more wood ships of the largest size, to be built this winter.

Another of the steel barges of the Minnesota Iron Co., the Magna, was launched a few days ago and is now ready for service. It will carry a load of about 4,000 gross tons on present draft.

The report of the Sault canals for August, just issued, shows the total tonnage of freight for the month to have been 2,513,835. Despite predictions of a great decrease in ore this is the greatest amount on record except the two months just preceding. In the season so far 5,203,810 gross tons of iron ore have passed out of Lake Superior, and 1,650,000 tons from Lake Michigan.

Owing to the close of the Mahoning Ore Co's mines on the Mesaba range, Minnesota, the Duluth, Superior & Western, formerly the Duluth & Winnipeg, has taken off all its ore trains and is now doing only a small amount of way freight and passenger business. The extension of this line into the northwestern grain country, by its new owner, the Canadian Pacific, has been postponed for a time.

CAR BUILDING.

The Midland Terminal of Colorado has ordered two new engines and four new coaches for service between Cripple Creek and Gillett.

The first consignment of new motor cars to be used on the New York & Brooklyn bridge was shipped this week by the Pullman Car Company. The new cars are heavier than those in present use, and are fitted with heavy motors, beside a grip attachment to catch the cables. The cars will be run on their own trucks from Chicago. These cars are to be used to switch the bridge trains at the terminals, taking the place of the shifting engines now in use, and will also carry passengers. Each bridge train will have one of the motor cars attached for shifting at the terminals.

BRIDGE BUILDING.

Baltimore, Md.—Bids for an iron bridge over George's Run, near Shomberger's mill, were opened by the County Commissioners as follows: Nelson & Buchanan, Chambersburg, Pa., $1,510; Toledo (O.) Bridge Co., $1,488; Wrought Iron Bridge Co., Canton, O., Bid A, $1,348, Bid B, $1,465, Bid C, 1,523; Youngstown (O.) Bridge Co., $1,550; Groton (N. Y.) Bridge & Mfg. Co., $1,525; Berlin Iron Bridge Co., $1,499; King Bridge Co., Cleveland, $1,388; C. H. Smith, Elkton, Md., $1,543.

Bedminster, Pa.—Nelson & Buchanan, Chambersburg, Pa., have been awarded the contract for the superstructure of a bridge over the Tohickon at Stover's Ford, at $5,050, according to reports. Other bidders were the Horseheads (N. Y.) Bridge Co., $5,500, and the Penn Bridge Co., Beaver Falls, Pa., $5,100.

Carlisle, Pa.—Bids on a proposed bridge over Conodoguinet Creek, at Geremyer's Mill, have been received as follows: Wrought Iron Bridge Co., Canton, O., $13,900; Dean & Westbrook, New York, $13,180; Pennsylvania Steel Co., $14,598; Horseheads (N. Y.) Bridge Co., $14,368; Nelson & Buchanan, Chambersburg, Pa., $12,900; Canton (O.) Bridge Co., $14,178; Groton (N. Y.) Bridge Co., $13,400; Berlin Iron Bridge Co., $13,725. The County Commissioners have awarded the contract for the bridge to Nelson & Buchanan. The bridge will have one span instead of two, and in consequence of this the cost of building was reduced from $12,900 to $10,200.

Cincinnati, O.—Reports say that the contract for the bridge over the Miami River and Big Dog Run, at Indian Hill, Anderson Township, has been given to the Brackett Bridge Co., of Cincinnati, for $45,900.

Denver, Col.—Bids for the new bridge on Lawrence street over Cherry Creek were opened by the Board of Public Works as follows: Chicago Bridge and Iron Co., steel floor joist, $15,000; wooden floor joist, $14,000; Milwaukee Bridge and Iron Works, steel, $14,289; wooden, $13,289; Youngstown Bridge Co., steel, $14,300; wooden $13,494; Missouri Valley Bridge and Iron Works, steel $13,932; wooden, $12,732.

Green Bay, Wis.—Plans have been made for the bridge at Main street over Fox River. E. L. Shaw, City Engineer, Marinette, Wis.

Griswold, Man.—Plans have been prepared by the Department of Public Works for a bridge over the Assiniboine River at this place. Tenders will be asked soon.

Guelph, Ont.—The tender of Messrs. Dunbar and Cape has been accepted for the new Gow's bridge.

Milwaukee, Wis.—It is stated that the Council Committee on Roads and Bridges has recommended that the contract for the bridge over the railroads at Seventh avenue, and for the one over Minnehaha Creek at Nicollet avenue, be awarded to the Wisconsin Bridge Co., Milwaukee, whose bids were $28,970 and $3,244 respectively.

Montreal, Que.—Mr. C. N. Armstrong, Managing Director of the Montreal Bridge Co., has given notice that Mr. Walter Shanley, C. E., to whom all the plans received by the company in response to its advertisement were submitted, has awarded the first prize to Mr. E. S. Shaw, C. E., of Boston, Mass., and the second prize to Mr. A. L. Bowman, C. E., of Roanoke, Va. Because Mr. Shanley called special attention to the plans by Mr. J. W. Balet, C. E., of New York, which, though possessing peculiar merit, did not comply with all the conditions of the advertisement, the company has awarded a special prize to Mr. Balet.

New York.—Work on the new high level bridge over the Harlem River at Third avenue, which the city is building, is progressing, though slowly, and conflicts of jurisdiction and difficulties concerning real estate for the approaches still cause delays. Work on this bridge was begun nearly three years ago, and the 294-ft. draw span is now practically finished, but the fixed spans have not yet been begun. The approach on the north side is far from being completed.

It will be several months yet before the new high level four-track drawbridge of the New York Central & Hudson River, over Harlem River at Fourth avenue, will be put in use, although both the bridge and the approaches are practically completed, and the elevated structure south of the bridge, which must be put in use at the same time, is also completed as far as it can be, until the present low-grade tracks shall have been put out of service and torn up. The delay is owing to changes in the plan of the station at 125th street, half a mile south of the river, which has to be built in connec-

tion with the new elevated structure. The wide, elevated metal flooring built in the street, to support a station on the level of the tracks, came so near some of the adjoining buildings that an injunction against the further prosecution of the work was secured by abuttors, and after long delay the railroad company, rather than submit to the prospective damage suits, has changed the plans and will make the structure much narrower, though in order to do this it will be necessary to place the station beneath the tracks.

Norfolk, Va.—As soon as the city obtains the consent of the Norfolk & Western the contract will be let for the new steel bridge over Smith's Creek on the extension of Granby street. The bridge will be 100 ft. long and 40 ft. wide. $10,500 has already been appropriated by the city toward the building of the bridge.

Paterson, N. J.—At the last meeting of the County Board of Freeholders, it was resolved to build a Melan bridge on the Paterson and Hamburg Turnpike. Specifications and plans are being made by the Melan Arch Construction Co., 71 Broadway, N. Y., and bids will shortly be asked for.

Portsmouth, N. H.—The contract for the North Mill bridge at this place has been awarded to Sugden Brothers for $9,785.

St. Paul, Minn.—The City Engineer has been instructed to prepare plans for a bridge over the railroads at Raymond avenue.

Toronto, Ont.—A new steel bridge will be built over the Etobicoke River at the first concession north of Dundas street in place of the one that collapsed.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In New York it is said that where a carrier delivers goods to the person to whom they are consigned, after notice by the real owner not to do so except on his written order, no further demand is necessary to entitle such owner to maintain an action against the carrier for their conversion.[1]

In the same state it is laid down that though a carrier is not authorized to deliver goods to another than the consignee, merely because the consignee had bought them to fill an order of the other person and intended that they should go to him, yet the carrier's act in so delivering them is ratified by the consignee treating them as the property of the other, and rightfully in his possession, writing to him for the purchase price, and agreeing to put them in proper shape.[2]

The Supreme Court of Texas rules that a railroad is not liable for special damages for delay in transportation of food for cattle, the cattle thereby being without the food for several days, where, at the time of the execution of the contract of shipment, the carrier was unaware that such special damages would arise from delay, though the carrier is required to receive goods for shipment at the rate fixed by the railroad commission and cannot limit its liability by special contract.[3]

In South Carolina railroad companies cannot limit their liability for the proper care of goods after their arrival at their destination by stipulations in the bill of lading.[4]

In Texas it is held that where it is shown that by local custom placing goods on a depot platform for shipment by a carrier was a delivery to the carrier, a railroad company is liable to the owners for the value of cotton placed on its platform for shipment with the knowledge of its agent, and destroyed while there by fire set by a boy who was playing on the platform, and could have been seen by the agent from the depot office.[5]

The Federal Court holds that transportation of hay between Memphis, Tenn., and Charleston, S. C., between which points there is competitive transportation by rail, by water and rail, and by water alone, is not performed under substantially similar conditions with transportation between Memphis and an interior town in South Carolina, which is reached only by one railroad.[6]

Injuries to Passengers, Employees and Strangers.

In Kansas as a rail being carried on the shoulders of section men was about to be put down the foreman took a position in front of the rear man for the purpose of relieving him so that he might step aside before the rail was thrown down, and before the latter had stepped to a place of safety, the foreman gave the signal to throw, and the rail was thrown against the man, injuring him. The Supreme Court holds that the foreman was guilty of negligence.[7]

In Texas the complaint, in an action by a fireman against a railroad company, alleged that the conductor was incompetent, which was known by defendant, but not by plaintiff, and that he negligently allowed a detached part of the train to collide with the part attached to the engine, injuring plaintiff. The Supreme Court decides that judgment for plaintiff was sustained by evidence showing, not only that the conductor's habits made him incompetent, and that this was known to defendant, but not to plaintiff, but also that the conductor should have known that the train was divided, that it was his duty in such case to see that the brakes were properly applied by both front and rear brakemen, that the conductor and his rear brakeman were drunk, and that, without the assistance of one of them, the other brakeman was unable to hold the rear section of the train.[8]

In Virginia in an action for the death of plaintiff's decedent, in a collision between the two sections of a train, which parted on account of defective couplings, it appeared that decedent was riding with another brakeman upon the rear section; that the flat car on which they were riding was the second car of their section, a box car being in front of them; that, after the train parted, the sections ran for five miles before the collision, a part of the distance being over an ascending grade. The section upon which decedent was riding was properly supplied with brakes and could have been stopped if even one brake had been applied. The engineer failed to keep his train in motion, as required by a rule of the defendent company, until he knew that the rear section had been stopped. The Supreme Court rules that the proximate cause of the collision was either the negligence of decedent or his fellow brakeman in failing to stop the rear section, or the negligence of the engineer in stopping the first section before he knew the rear section had stopped, and not the defective couplings, and, therefore, as a matter of law, defendant was not liable.[9]

In Texas it is held that where the evidence showed that a certain rule, requiring railroad conductors to protect their trains by sending men back to put down torpedoes, and to flag approaching trains, did not apply to water stations, and was so understood by all trainmen, a failure of a conductor to comply with the rule at such station was not contributory negligence.[10]

In Wisconsin it is held that a section hand, whose duties required him to ride over the road on a hand car, and who had been notified by the company, and of his own knowledge knew, that "wild" trains were frequently run over the road at a high rate of speed, assumed the risk of injury from being run into by one of these trains running at a high rate of speed, on a foggy morning.[11]

In Virginia it is ruled that a brakeman cannot, as a matter of law, be held to be negligent in failing to discover that the bumpers on cars he is about to couple were rotten, and so defective as to permit the cars to come almost together, so as to prevent a recovery for his death, caused by such defects.[12]

In the same case it is held that chalk marks, meaning "out of order," placed on the cars to inform the road from which they were received that the cars were out of order when received, and that the defendant company was, therefore, not liable for their repair, are not, as a matter of law, notice to a brakeman that the bumpers are defective, so as to prevent a recovery for his death caused thereby in coupling the cars.

In Michigan cattle guards being required and used on all railroads, the danger of accidents to employees in operating trains over them is one of the assumed risks of the employment.[14]

In Minnesota a freight train brakeman has implied authority to eject trespassers and apparent trespassers from the cars of the train.[15]

[1] Lester v. D., L. & W., 36 N. Y. S., 907.
[2] McSwegan v. P. R. R., 37 N. Y. S., 943.
[3] M., K. & T. v. Belcher, 35 S. W. Rep., 6.
[4] Heath v. S. B. R. R., 24 S. E. Rep., 166.
[5] Ft. W. & D. C. v. Martin, 35 S. W., Rep. 21.
[6] Behlmer v. L. & N., 71 Fed. Rep., 835.
[7] A., T. & S. F. v. Vincent, 43 Pac. Rep., 251.
[8] Int. & G. N. v. Wing, 34 S.W. Rep., 292.
[9] Richmond & D. v. Tribble, 24 S. E. Rep., 278.
[10] T. & P. v. Johnson, 34 S. W. Rep., 186.
[11] Hinz v. C., B. & N., 66 N. W. Rep., 718.
[12] C. & O. v. Lash, 24 S. E. Rep., 385.
[13] C. & O. v. Lash, 24 S. E. Rep., 385.
[14] Fuller v. L. S. & M. S., 66 N. W. Rep., 593.
[15] Brevig v. C., St. P., M. & O., 65 N. W. Rep., 401.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1½ per cent. on preferred stock, payable Oct. 1.
Manhattan, quarterly, 1½ per cent., payable Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, company's office, Birmingham, Ala., Oct. 7.
Ann Arbor, annual, company's office, Durand, Mich., Sept. 19.
Chesapeake & Ohio, annual, Pace Building, Richmond, Va., Oct. 20.
Chicago, Indianapolis & Chattanooga, annual, The Denison, Indianapolis, Ind., Sept. 16.
Chicago, Milwaukee & St. Paul, annual, company's office, Milwaukee, Wis., Sept. 19.
Elgin, Joliet & Eastern, annual, Chicago, Sept. 15.
Fitchburg, annual, company's office, Boston, Mass., Sept. 30.
Great Falls & Canada, annual, company's office, Great Falls, Mont., Sept. 11.
Iowa Central, annual, Chicago, Sept. 4.
Lake Erie & Western, annual, company's office, Peoria, Ill., Oct. 7.
Minneapolis & St. Louis, annual, company's office Minneapolis, Minn., Oct. 6.
New York, Ontario & Western, annual, 56 Beaver street, New York, Sept. 30.
St. Louis Southwestern, annual, company's office, St. Louis, Mo., Oct. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Street Railway Association* will hold its annual convention at St. Louis on Oct. 24 and 25.

The *American Institute of Mining Engineers* will hold its annual meeting in Denver, Col., beginning on Sept. 21. For provisional programme see issue of July 24, page 530.

The *American Society of Railroad Superintendents* will hold its next annual convention at Niagara Falls, N. Y., beginning Sept. 9.

The *American Association of General Passenger Ticket Agents* will hold its next annual convention at Atlantic City, N. J., beginning Sept. 15.

The *Travelling Passenger Agents' Association* will hold its next annual convention at St. Louis, Mo, beginning Sept. 29.

The *American Railway Association* will hold its next annual convention at the Hoffman House, New York City, Oct. 7.

The *Freight Claim Association* will hold its next annual convention at The Jefferson, Richmond, Va., beginning Oct. 7.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its annual meeting at Chicago on Oct. 20. For programme see issue of Aug. 7, page 560.

New York Railroad Club.

The next regular meeting will be held at the rooms of the American Society of Mechanical Engineers, No. 12 West 31st street, New York, at 8 p. m., Thursday, Sept. 17, 1896. The discussion will be on a paper by Prof. W. F. M. Goss, on "The Effect of High Rates of Combustion upon the Efficiency of Locomotive Boilers." An advance copy of the paper will be mailed to members and it will not be read at the meeting.

Western Society of Engineers.

The semi-monthly meeting of the Western Society of Engineers was held Sept. 2, in the rooms of the society, Monadnock Block, Chicago.

About fifty civil and consulting engineers were present and listened to a paper prepared by Mr. Cicero D. Hill, consulting engineer on municipal work. The subject of the paper was "Street Pavements in Chicago,' and an interesting discussion followed the reading.

The next meeting will take place Sept. 16, when Mr. H. C. Alexander and Mr. J. F. Foster will read papers on "Parks and Roads."

PERSONAL.

—Mr. Frederick Cowden, Foreman, has been promoted to be Superintendent of the Franklin (Pa.) Steel Casting Works.

—Mr. A. C. Martin, General Agent at Seattle, for the Oregon Railway & Navigation Co. and Union Pacific, has resigned.

—Mr. F. A. Leland, chief clerk to Traffic Manager Miller, of the Missouri, Kansas & Texas, has been appointed Assistant General Freight Agent of the company, with headquarters at Kansas City.

—Mr. S. J. Henry has been appointed Assistant General Freight Agent of the Rio Grande Western Railroad. Mr. Henry for 18 months past has been Chief Clerk in the freight office of the Atchison, at Denver.

—Mr. W. W. Miller, who has been Commercial Agent of the Missouri, Kansas & Texas, at Kansas City, has been appointed General Live Stock Agent of the company at Fort Worth, Tex., succeeding Mr. R. Jones, resigned.

—Mr. C. H. Chappell, Jr., son of Vice-President and General Manager Chappell, of the Chicago & Alton, has been appointed soliciting freight and passenger agent of railroads comprising the Seaboard Air Line, with office at Memphis, Tenn.

—Mr. E. E. Ellis, Tacoma Agent for the Oregon Railway & Navigation Co. and the Union Pacific, has been promoted to be General Freight and Passenger Agent for the Northwest, with headquarters in Seattle Mr. Ellis has been Manager of the Tacoma & Lake City Railroad. His successor has not been named.

—Mr. William B. Curtis, Traffic Manager of the Traffic Association of California, has resigned, and will go to Japan for a term of years in the interest of large business houses of San Francisco. Mr. Curtis succeeded Mr. Leeds in this position about a year ago. He was previously for many years in the traffic department of the Southern Pacific.

—Mr. E. K. Voorhees, Commercial Agent of the Kansas City, Memphis & Birmingham, with headquarters at Memphis, has been appointed Assistant General Freight Agent with offices at Birmingham, Ala., and Memphis. Mr. E. T. Wilcox, who has been soliciting Freight Agent at Birmingham, has been made Contracting Freight Agent, with headquarters in Birmingham. Mr. W. P. Adams, who has been Soliciting Freight Agent, becomes Contracting Freight Agent at Memphis. Mr. Voorhees succeeds Mr. J. D. Riddell, who has been transferred to Kansas City.

—Col. D. F. Whitcomb, for some years Superintendent of the Indianapolis Union Railway Co., which owns the Union station at Indianapolis, and the Belt road, died at Potter Place, N. H., last week. Mr. Whitcomb begun railroading on the Vermont Central, and about 20 years ago removed West and entered the service of the Cincinnati, Hamilton & Dayton. A few years later he went to the Louisville & Nashville as Division Superintendent, and in 1880 was appointed Superintendent of the Union Railway Co. and the Belt road, at Indianapolis, which position he held until the appointment of A. A. Zion as Superintendent, two years ago.

—Mr. J. Snowden Bell has resumed individual practice at Pittsburgh (Carnegie Building) and will continue to devote exclusive attention to patent litigation in the United States Courts, the soliciting of United States and foreign patents and all other business relating to letters patent, including examinations and reports on the novelty and patentability of inventions, the validity and scope of patents and questions of infringement. Practical training and experience in steam engineering and railroad machinery, and an extended practice in connection with patents for inventions in these branches of mechanics, enable him to render efficient service to clients having business connected therewith.

—Mr. J. P. Beckwith has been appointed Traffic Manager of the Florida East Coast road. The office of Traffic Manager of the Florida East Coast Railway is a new one. Mr. Beckwith will have general supervision of the freight and passenger departments. The former General Passenger Agent, Mr. Joseph Richardson, resigned three months ago, and is now Commissioner Southern Passenger Association. J. D. Rahner, Assistant General Passenger Agent, will retain his position, and W. J. Jarvis is General Freight Agent. It has not been definitely determined as yet whether Mr. Beckwith will make his headquarters in Jacksonville or St. Augustine. Mr. Beckwith was formerly General Freight Agent for the Jacksonville, Tampa & Key West, which position he left about a year ago to become General Freight and Passenger Agent of the Ocean Steamship Co., with headquarters in New York City.

—In our issue of Aug. 21 we noticed certain changes in the working organization of the Norfolk & Western, due, doubtless, to the necessity for reducing expenses to the lowest point. Among other changes was the abolition of the office of Division Superintendent of Motive Power, heretofore held by Mr. R. P. C. Sanderson. This, we suppose, will make Mr. Sanderson's services available for other railroads, although he remains on the Norfolk & Western as Assistant in the office of the Superintendent of Motive Power. The readers of the *Railroad Gazette* will hardly need to be told of the acquirements of Mr. Sanderson, for he has made numerous contributions in the last few years to the discussion of matters of special importance to motive power men and has been an active and useful member of the Master Car Builders' Association and of the Southern & Southwestern Railway Club, being now President of the latter.

—Mr. W. W. Finley, now Second Vice-President of the Great Northern, has been elected Second Vice-President of the Southern, to succeed Mr. W. H. Baldwin, Jr., resigned. Mr. Finley was formerly Third Vice-President of the Southern, resigning after a short term, to return to the Great Northern, of which he had been previously General Traffic Manager. Mr. Finley has had many years' service in various positions with railroads in the South and Southwest. In 1890 he was made Chairman of the Trans-Missouri Traffic Association and served as Commissioner of various traffic associations until he became General Traffic Manager of the Great Northern in 1892. Some two years later he became Commissioner of the Southern States Passenger Association, and last October became Third Vice-President of the Southern. He held this position but a few months before he received a proposition from President Hill, of the Great Northern, offering such inducements that he accepted the position of Second Vice-President of that company. This position he now resigns to return to the Southern.

—Mr. W. H. Baldwin, Jr., Vice-President and General Manager of the Southern Railway, has been elected President of the Long Island road to succeed the late Austin Corbin. Mr. Baldwin has become very well known to railroad officers since he went to the Southern Railway two years ago. There he has organized the operating department of the company and has had very wide powers. In the two years of the company's administration nearly three million dollars

have been spent under his direction in improvements of one kind and another. The results which the Southern has been able to show in the two years of its existence are in no small measure due to his energy. Mr. Baldwin has been in railroad service about 10 years and is now 36 years old. He is a graduate of Harvard University, of the class of 1885. He entered the law school at Harvard after his graduation, but left these studies to go into railroading on the Union Pacific under the administration of Mr. Charles Francis Adams. He was first made Division Freight Agent of that company and within a few years was made Assistant General Freight Agent at Omaha. In February, 1889, he was Manager of the Leavenworth Division at Leavenworth, and in September of that year became General Manager of the Montana Union, being also for a short time President of the road, one of the Union Pacific controlled lines. In August, 1890, he was Assistant to the President of the Union Pacific, at Omaha, but about a year later, after the resignation of Mr. Adams, he went to the Flint & Pere Marquette road as General Manager. He remained in this position three years, until his appointment as Third Vice-President of the Southern Railway, on July 1, 1894. He was made Second Vice-President on Oct. 1, 1895, and has since held that office. For the last few months, since the resignation of Mr. W. W. Finley, he has also had charge of the traffic department of the Southern. His resignation as Vice-President of the Southern takes effect on Sept. 15, and he will assume his new duties as President of the Long Island road by Oct. 1.

—J. F. Holloway is dead; or rather let us say in the dialect of the "Bonnie Brier Bush," of which he was an enthusiastic admirer, "He has slippet awa." His demise took place Sept. 2, at his residence, Cuyahoga Falls, O. after a brief and painful illness, at the age of 71.

He was one of the founders or charter members in 1880, of the American Society of Mechanical Engineers; a Manager until 1883; its President in 1884-5, and since then he has been an active worker in its board of management as an Honorary Councilor. He was a member and a past Vice-President of the Institute of Mining Engineers. He also was one of the founders of the Engineers' Club of New York City; was twice elected its President, and was a member of its board of management at the time of his death. A charter member of the Civil Engineers' Club of Cleveland, in 1880, he did more perhaps than any other man to increase its strength and usefulness. Elected Vice-President in 1882, and thrice elected President of the Club, he gave it his best energies and influence. He was constituted an honorary member in 1891.

He was a mechanical engineer of great ability. Without a collegiate education, but graduating from the bench and the draughting board his career affords another instance of what may be accomplished by a man naturally well-endowed who devotes himself with patient industry to his chosen calling.

In his early manhood he entered the service of the Cuyahoga Steam Furnace Company, the earliest concern of the kind in Northern Ohio, it having been incorporated in 1834. He became superintendent and engineer of the company, and upon the death of its president, Mr. W. B. Castle, in 1872, Mr. Holloway was elected to fill the vacancy. Under his management the concern had a most successful career. He combined all its important offices in himself, and directed its affairs with great ability. During his incumbency the company never passed a dividend, whatever might be the financial condition of the country. Engines and other machinery of his design went out to supply the Northwest as well as the home trade. Many blowing engines for blast furnaces were placed; The Illinois Steel Co. has some 10 or 12 of these still in use. Rolling mill engines and machinery were turned out, besides a general trade in stationary engines. His marine engine became the accepted standard for screw propellers on the great lakes. This was a vertical engine supported on an A frame. Engines of the same type were also used on land and found a market all along the lakes as far as Duluth and St. Paul. The company also built pumping engines, some of them of large size. In 1885 his company sold out to the Cleveland Ship Building Co., which continues the business.

Mr. Holloway having accumulated a competence, did not expect to engage in further business, but almost immediately he received an invitation to become Consulting Engineer to the H. R. Worthington Co., of New York, which he accepted and removed with his family to New York. On resigning this office not long ago he again intended to retire to private life, but within a month he had received no less than four distinct offers, each at a higher salary than he had been receiving. He accepted an offer from the Snow Steam Pump Works, of Buffalo, and was their Consulting Engineer at the time of his death.

As an engineering councilor his calm, judicial mind, even temperament and keen perception placed him in the first rank. He was pre-eminently a man of safe judgment, diplomatic, persuasive rather than aggressive and yet with no uncertainty, if the needs required, as to his actual opinion and position upon any matter of definite importance. Mr. Holloway was a graceful writer, a ready speaker, keen and witty, and a clear debater on engineering subjects.

But the foregoing does not, nor would any purely technical estimate, give Mr. Holloway his highest and most worthy place; which was his unique position as the social aggregator of engineers, and in the result of his efforts to elevate, coalesce, and broaden the engineering profession. In this direction he never ceased to exercise his influence. He believed in the engineer and his function; that like the iron worker at Solomon's Temple, to him, and to him alone, by *right* and not by privilege, belonged the seat of honor at the right hand of all other arts and professions. Moreover, this work was undertaken and performed with intelligent design and with no selfishness in the motive. His belief was that the engineer would be that much the more potent a factor when his real value to the world became the better known and the more promptly recognized. And it was but a few weeks before his death, during a conversation at the Engineers' Club, that he illustrated this principle by quoting from Maclaren's story of "The Mourning of the Glen" "Wae's me," said Jamie, "That fouk 'ill tak a man's best wark a' his days without a word an' no dae him honor till he dees. Oh, if they hed only githered like this juist aince *when he was livin.*'"

He was still a young man in activity and spirit and although he may have experienced the usual share of human disappointment and failure, this was never apparent. It is no exaggeration to say that what is here written of Mr. Holloway, departed, might with equal propriety have been said of him in his life. The good that he could say of anyone was not reserved for post-mortem expression and the bad he kept to himself. He was genial, courtly, helpful, inspiring; a manly man of lovely character; for sure he was "far ben," and the sorrow of it is that such gentle spirits cannot the longer linger with and imbue us of the other kind.

But we cannot better close than to here apply to Mr. Holloway his own eloquent words, spoken at the close of his memorial address, in 1880, over his friend Alexander L. Holley: "When his biography shall be truly written it will be found that while his accomplished work and deeds as an engineer will give him a place among the ablest in the profession he so well adorned, his highest and best monument will be found in the loving memory of him that will ever linger in the hearts of his friends." Mr. Holloway's memory will long "linger in the hearts of his friends." And this more than aught else is that which he himself would have most desired and prized.

ELECTIONS AND APPOINTMENTS.

Cambria County.—The directors of this new company in Pennsylvania are: M. E. Olmsted, W. M. Ogelsby, A. C. Stamm, H. C. Houtz, all of Harrisburg; A. G. Palmer, Jersey Shore; T. E. Herriman, Wm. T. Grier, Philadelphia.

Chicago Great Western.—The annual meeting of the stockholders was held in Chicago, Sept. 4. H. A. Gardner, of Chicago; H. E. Fletcher, of Minneapolis, and A. Oppenheim, of St. Paul, were unanimously re-elected directors.

Erie & Eastern.—Dr. A. A. Freeman, of Erie, Pa., has been elected President and J. J. Roemer, of Erie, Pa., Secretary of this new company.

Long Island.—At a meeting of the Directors held in New York City, Sept. 8, William H. Baldwin, Jr., was elected President, after having been made a Director in place of Andrew R. Culver, resigned. Austin Corbin, Jr., was elected a Director of the road to fill the vacancy caused by the death of his father.

New York, Susquehanna & Western.—The annual meeting of the stockholders was held at Jersey City last week, and the following directors were chosen: Amos L. Hopkins, Roswell Eldridge, Simon Borg, Henry Sanford, Herman O. Armour, Henry B. Plant, Thomas A. McIntyre, Cornelius C. Cuyler, Garret A. Hobart, George W. Young, Cyrus J. Lawrence, W. Lanman Bull and Gustav E. Kissel.

Southern.—Owing to the resignation of the Second Vice-President, W. H. Baldwin, Jr., to take effect September 15. W. W. Finley, formerly Third Vice President of the Company, was chosen to succeed Mr. Baldwin as Second Vice-President, at a meeting of the directors last week.

Union Pacific.—Mr. George E. Abbott has been appointed General Agent of the Passenger Department with headquarters at Sioux City, Ia., vice Mr. D. M. Collins, who assumes general agency of freight department at that point. In addition to above Mr. Abbott will also retain charge of the Des Moines office.

RAILROAD CONSTRUCTION
Incorporations, Surveys, Etc.

Cambria County (Pa.)—This road was incorporated at Harrisburg Aug. 31, with a capital of $100,000, to build a line seven miles long from a connection with the Cambria & Clearfield at Wigton Colliery to Spangler, Pa. M. E. Olmsted, of Harrisburg, Pa., is President, and he is also President of the Beech Creek & Buffalo & Susquehanna. The Superintendent of the Beech Creek, A. G. Palmer, Jersey Shore, Pa., is one of the incorporators.

Chicago & Eastern Illinois.—The Southern extension, beyond Shelbyville, Ill., the present terminus, which is being built under the name of the Shelbyville Southern, will probably be completed by Dec. 1. It will give the company a connection at Altamont, Ill., with the Chicago, Paducah & Memphis, which it will begin operating on the date named, extending its service 95 miles farther into Southern Illinois and almost to the Ohio River. The new road between Shelbyville and Altamont is 25 miles long.

Cincinnati, Portsmouth & Virginia.—The work of changing the roadbed between Rocky Ford and a point one mile east of Summit, a distince of about five miles, has been commenced. The work will be completed about Jan. 1, and will cost about $30,000.

Detroit & Mackinac.—The extension of this line recently constructed from Emery Junction to Bay City, Mich., will be opened for business on Sunday, Sept. 20, at noon. The connection of this road with the Michigan Central at Alger, Mich., will be discontinued on the same day. All freight and passenger business for Tobico, Linwood, Pinconning, Saganing, Pine River, Omer and Turner, Mich., on the new line and all points on the old system except Alger, Moffat and Shearer (which will be abandoned by this company) will be done via Bay City, Mich.

Florence Southern.—W. K. Johnson and W. R. Johnson, of Denver, the projectors of this road, have just made a trip over the proposed line, with J. B. Orman, the well-known railroad contractor, of Pueblo, Col. The road will be 35 miles long, being practically an extension of the Florence & Cripple Creek road, of which Mr. W. K. Johnson was formerly President. It is said that the contract for the new line will be given out this winter.

Lehigh & Lake Erie.—The New York State Railroad Commissioners have denied the application of the company for authority to construct a proposed connecting line near Buffalo. The plan was to build a new line from a point in the town of Cheektowaga to the Tifft Farm, in Buffalo, to be operated in connection with the Lehigh Valley road. The application was opposed in behalf of the New York Central, the Terminal Railroad of Buffalo and the Erie Railroad.

Lehigh Valley.—It is reported that the company proposes to build a second track along the entire New Boston branch from Hazleton, Pa., to Delano. A second track has been in operation between Audenried and Hazleton for the past two years. The branch will be double-tracked to Silver Brook Junction or McAdoo before the winter, and preparations for this work have been in progress for some time.

Lexington & Eastern.—Arrangements are being made for the extension of this road from its present terminus (Jackson, Ky.) toward Big Stone Gap, Va., over 100 miles. The business interests of Norfolk, Va., are interested in the extension, as by its construction that city will be given a direct through line to Louisville, Ky., by the Norfolk & Western. President McDowell intimates that work would probably begin soon on the proposed extension.

Mexican Central.—Press dispatches from Mexico state that E. A. Correa, a civil engineer of this company, is going over the route of the proposed extension from Chihuahua to Batopilas, to report as to the resources of the country through which the extension will pass and the approximate cost of the work. The Mexican Central has also decided to build a branch line from Juarez to the Corralitos mining district.

Pittsburgh & Western.—A local paper states that a branch road from the main line will be built to the Beaver valley and that engineers have recently surveyed a route from Callery Junction, Pa., to Crows Run, near Conway. The distance from Callery Junction to the Pittsburgh, Ft. Wayne & Chicago tracks is 13 miles. According to the same authority it is also the intention to skirt the hill through Conway, Freedom, Rochester, New Brighton, and thus reach Beaver Falls, crossing the Beaver River above the Tenth street bridge.

Rural Hall & Statesville.—Residents of Davie and Yadkin counties and the town of Statesville, N. C., are moving to secure the building of a road from Rural Hall, on the Cape Fear & Yadkin Valley to Statesville, N. C., via Yadkinville. Yadkin county, one of the richest counties in North Carolina, has no railroad tracks in its limits. The extension of the present short road from Winston to Mocksville, N. C., which was originally intended to penetrate Yadkin County, is also being considered. This road is controlled by the Southern.

Southwest Arkansas & Indian Territory.—The contractors for the extension of this road in Arkansas and Indian Territory are now within two miles of Pike City, Ark. A large gang of men is now at work on the last bridge, and on its completion the rails will be laid into the town. The extension is 10 miles long from Antoine.

Union Pacific, Denver & Gulf.—Since the rebuilding of the six miles of the Colorado Central, washed out last spring, was completed a week or two ago, General Superintendent Dunaway has been engaged in another work of a similar nature, reconstructing the track of the Catskill branch from Trinidad out, which has been washed away by flood waters. The work is being pushed as rapidly as possible from both ends, and the line will be opened again within two or three weeks. Trains are now being run out from Trinidad as far as Martinsen.

Electric Railroad Construction.

Allegheny, Pa.—The Kerr Street Railway Co. has been organized with a capital stock of $6,000 for the purpose of building a street railroad in Kerr street, to be operated by electricity or compressed air. Those interested are James R. Jenkins, Allegheny; Oscar R. Gratly, Crafton, and Mr. J. McCann, Pittsburgh.

Allentown, Pa.—Hugh E. Crilly, of Allentown, has been awarded the contract to build an electric road from Wilmington to New Castle, Del., a distance of nine miles. The road is to be in operation by January 1, 1897. It has a charter from the state of Delaware to carry passengers, freight, express, baggage and mail and to light the city of New Castle with electricity. Construction work began Sept. 4.

Baltimore, Md.—The Commissioners have signed the order for the franchise of the Falls Road Electric Railway, referred to in our issue of Aug. 14. Flat rails will be used in Mount Washington village.

Chicago, Ill.—On Aug. 26, the Chicago West Side Railway Co. began to run cars on its Twelfth Street line through Van Buren street to State street. Heretofore, the electric line stopped at the Chicago River, the cars being hauled uptown by horses.

Cincinnati, O.—The Doane Electric Co. has been incorporated with a capital stock of $10,000 by John E. Devere, George L. Jones and others. The company proposes to construct an electric road in Cincinnati.

Detroit, Mich.—It is stated that the material for the new electric line of the Detroit Railroad, between Detroit and Ann Arbor, Mich., has already been delivered half way to Dearborn, and that poles have been erected for the first four miles of the road. It is expected that the line will very shortly be in operation as far as Springwells. The present plan is for the ultimate extension of the line from Dearborn to Ypsilanti, where it will connect with the road already built between Ypsilanti and Ann Arbor. By this route, the total distance between Detroit and Ann Arbor will be about 40 miles.

Hagerstown, Md.—The Potomac street branch of the Hagerstown Electric Railroad was completed last Saturday. The new line is doing well, and is pushing its feeders in several directions.

Hamilton, Ont.—The Radial Railway Co. will extend its line from the power-house to Port Nelson, and next spring it will be extended to Oakville. The franchise was granted about the middle of May.

Jackson, Tenn.—The Jackson & Suburban Street Railway Co. has closed a contract with Van Aiken & Co., of New York, to put in an electric street railroad and an arc and incandescent electric light plant to be installed in Jackson.

Long Island, N. Y.—The electric line now being built in Queens County will have 30 miles of road if the present plans are carried out. The line will run from the terminus of the Kings County Elevated road in Liberty avenue, in that avenue to Jamaica, and from there to Far Rockaway, with stations at Woodhaven, Ozone Park, Morris Park, Dunton, Woodsburg and Lawrence. Another branch from Jamaica will run to Hempstead, passing through Hollis and other small places. A double track is being laid in Liberty avenue to Jamaica. The balance will be single track, with frequent turnouts. The rails weigh 78 lbs to the yard. The cars will be mounted on eight-wheeled trucks, and have high-speed motors so that a speed of from 35 to 40 miles an hour may be attained. The cars are to be arranged like the coaches on steam roads. Benjamin Norton is President of the new company.

Medway, Mass.—The Medway & Franklin Street Railway Co. has been organized, with a capital stock of $40,000, to build an electric line 16 miles long, from North Bellingham, through Caryville, West Medway, Medway and Franklin, to Wrentham.

New York.—Preparations are under way to extend the system of the Union Railway Co. by an electric line through Tremont avenue, which has lately been widened to 100 ft. and graded. The new line will extend from Third avenue to the Boston avenue road. There is some hope that the new line will be in operation within a month or six weeks.

Pittsburgh, Pa.—Work on the Brownsville avenue extension of the Pittsburgh & Birmingham Traction Co.

will be begun at once. Booth & Flinn secured the contract for the first 1¼ miles of the road. The other portion of the road, comprising three miles of single track, was awarded to Sloane, McIlwaine & Ott Bros., of Allegheny. The contract for the steel rails was awarded to the Johnson Steel Co., of Johnstown. The rails will be 9-in. 90-lb. girder rails, 60-ft. long. The Johnson Co. will superintend the construction of all the curves on the road, and other difficult special work. Meede & Speer were given the contract for furnishing 8,000 ties for the new work. The St. Louis Car Co. was given the contract for 22 cars of the most modern design. The contract for furnishing 24 pairs of 50-H. P. motors has been given to the Westinghouse Electric & Manufacturing Co.

Rockville, Conn.—The Rockville & Ellington Railroad Co. proposes to contest with the Hartford, Manchester & Rockville road for the franchise to build an electric line between this place and Talcottville, by way of Burke's Hill. The Rockville company has an application ready for the right to build a road from the lower steamboat landing at Snipsic Lake down Main, Union and Franklin streets, across private land already bought, to the Talcottville road, to a terminus in front of the library building in Talcottville. The company agrees to build the road in the best possible manner with 60-lb. T-rails and also to pave all that part of the highway between the tracks and 2 ft. on the outer side of each rail. This company, of which A. M. Young of Waterbury is President, now operates over 40 miles of road in the state.

St. Louis, Mo.—The Southern Electric Railway Co. has a plan on foot to extend its system into the extreme northern and eastern parts of the city. The present northern terminus is at Seventh and Howard streets, and its southern terminus is at Catalan street, in Carondelet, where it connects with the Jefferson Barracks extension. The plan now is to extend the northern branch to the cemeteries, the route passing through a very densely populated part of the city. When the extension has been completed the company will carry passengers from the cemeteries to the Catalan terminus for one fare. The bill asking for the franchise is now in course of preparation, and will be introduced into the Municipal Assembly as soon as the projectors have determined upon the selection of the route.

On Sept. 6 articles were filed for the incorporation of the St. Louis & Belleville Rapid Transit Co.

Toledo, O.—The Toledo, Bowling Green & Freemont electric line, to run between Toledo and Bowling Green, O., has been completed, and will be in operation within a few days. Four cars, with a seating capacity for 48, have been built for the company, and upon trial have been found entirely satisfactory. It is intended that the trip between Toledo and Bowling Green, 20 miles, be regularly made in one hour and a quarter.

White Plains, N. Y.—The White Plains and Elmsord Electric Railway has secured the franchise for laying its tracks through the town of Greenburg, and proposes to build the road at once, trusting to the public spirit of the authorities of the village of Tarrytown to give them a franchise for running the line through that place to the Hudson River Railroad station. Manager A. V. Kreeps hopes to have cars running over part of the line by Sept. 28. The company will then run stages from one railroad station to the other in Tarrytown until the remainder of the road is completed.

Wilmington, Del.—An electric road is projected to run between Wilmington and New Castle. It is said that work will be begun on the line within a few days, and it is expected that the road will be in operation before the first of next year.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The earnings for July are reported as follows:

	1896.	1895.	1894.
Gross earn	$2,152,541	$2,069,406	$1,606 732
Oper. exp	1,639,452	1,374,398	1,604,726
Net earn	$513,089	$195,008	$2,006
P. c. exp. to earn	76⅛	90⅝	99⅞
Net seven mos	3,946,937	2,494,148	2,256,688

Erie.—The earnings for all lines for July were:

	1896.	1895.	Inc. or dec.
Gross earn	$2,635,533	$2,622,702	I. $12.831
Working expen	1,853,078	1,990,474	D. 137,396
Net earn	$782,455	$632,228	I. $150,227

Included in the expenses of 1896 is one-twelfth of the entire taxes of the year.

Lake Shore & Michigan Southern.—The earnings for the four quarters to June 30, as reported to the New York State Railroad Commissioners are as follows:

	1896.	1895.	Inc or dec.
Gross earn	$21,477,931	$19,825,535	I. 1,652,396
Oper. exp	14,430,233	12,724,227	I. 1,706,006
Net earn	$7,047,698	$7,101,308	D. $53,610
P. c. exp. to earn	67¼	65⅛	I. 3⅛
Total inc	7,476,002	7,501,734	D. 25,732
Fixed charges	4,429,401	4,060,891	D. 231,490
Balance	$3,046,601	$2,840,843	I. $205,758
Dividends	3,021,340	3,021,340	
Surplus	$25,261	Def. $180,497	I. $205,758

Louisville, New Albany & Chicago.—Frederic P. Olcott, Henry W. Poor and Henry C. Rouse have agreed to act as a committee for the reorganization of the railroad, at the request of the holders of $2,500,000 of the bonds of that company.

New York, Susquehanna & Western.—Judge Acheson filed an opinion in the United States Circuit Court at Philadelphia last week overruling the demurrer of the Delaware, Lackawanna & Western Railroad Co., and requiring it to make answer to the suit of the above railroad. The demurrer was to the complainant's bill in equity praying for an injunction restraining the prosecution of a suit in the Supreme Court of New York. The action was brought by the Lackawanna company to have this road restrained from delivering coal, for the transportation of which there has been an agreement since February, 1882, to any common carrier except the Lackawanna company. The contention of the New York, Susquehanna & Western Co., among other things, is that the agreement is void on account of being contrary to public policy.

Southern Pacific.—Following are the earnings for July:

	1896.	1895.	1894.
Gross earn	$3,817,529	$3,988,902	$3,101,973
Oper. exp	2,499,934	2,688,855	2,193,574
Net earn	$1,317,595	$1,300,107	$908,399
Net seven mos	7,581,933	7,931,952	7,519,136

West Virginia Central & Pittsburgh.—The annual report of the company for the fiscal year ended June 30, 1896, shows the following results:

	1896.	1895.	Inc. or dec.
Gross earn	$612,689	$531,536	I. $81,153
Oper. exp	396,790	345,301	I. 51,489
Net earn	$215,893	$186,235	I. $29,663
Net from P. & C. Ry	10,663	20,288	D. 9,655
Coal mining profit	102,607	88,039	I. 19,568
Total net	$329,139	$289,563	I. $39,576
Interest on bonds	180,000	180,000	
Depreciation plant, etc	22,253	4,700	I. 17,553
Total deductions	$202,253	$184,700	I. $17,553
Surplus	126,885	104,862	I. 22,023

Electric Railroad News.

Belleville, Ont.—Messrs. Pinkerton and Cook, of Toronto, are negotiating for the purchase of the franchise of the Belleville Traction Co. The road is six miles in length.

Brooklyn, N. Y.—The gross earnings of the Brooklyn Rapid Transit Co. for the month of August are as follows:

	1896.	1895.	1894.
Brooklyn Heights R. R. Co	$420,705	$387,343	$414,868
Brooklyn, Queens Co., & Suburban	69,420	63,824	61,441
Total for system	$490,125	$451,167	$476,310
Two months to August 31.			
Brooklyn Heights R. R. Co	$853,876	$795,066	$858,425
Brooklyn, Queens Co., & Suburban R. R. Co	138,674	128,327	115,265
Total for system	$992,550	$923,393	$973,691

Chicago, Ill.—The General Electric Railway Co. has filed a suit for $250,000 damages against the Chicago City Railway Co. for procuring the injunction ordered by Judge Tuley restraining it from laying tracks, and proceeding with the construction of its road. The Appellate Court reversed the decision of Judge Tuley.

Columbus, O.—The Columbus Central Railway Co. went into the hands of George H. Worthington, of Cleveland, as Receiver on Sept. 4. The company is capitalized at $1,500,000 and is bonded for that amount. It has $175,000 in notes and open accounts. The company owns a suburban road and depends largely upon this traffic for its income. The rainy season cut off this income this year and rendered the company unable to meet its obligations to small claimants.

Newton, N. Y.—It is stated that the Directors of the Newton Street Railway Co. will apply for authority to issue $100,000 of new capital stock. It is understood that the proceeds of this issue will be used for extensions of the road.

Scranton, Pa.—On Sept. 2, M. E. Olmstead, Major Everett Warren and Horace Hand appeared before Attorney-General McCormick at Harrisburg, asking for a writ of quo warranto against the Citizens' Street Railway Co., of Scranton, claiming that it had been illegally chartered and had no right to occupy the streets of that city. Messrs. Davis and Kelly, of Scranton, appeared on behalf of the railroad company. The Attorney-General announced that the writ would be issued.

Seattle, Wash.—The Seattle Consolidated Street Railway Company will be sold at foreclosure on Sept. 26.

TRAFFIC.

Traffic Notes.

The Texas railroads have rescinded their action looking to the establishment of a cotton-weighing bureau.

The Seaboard Air Line announces 2,000-mile tickets at $40 each, a reduction of $10 from the rate heretofore existing.

It is reported that shippers of lumber in Eastern Texas have lately received large orders from South Africa, and that shipments are now being made in large vessels from Sabine Pass.

A Boston reporter learns from a railroad president that merchandise shipments from New England to the West are now 35 per cent. smaller than at this time last year. Freight receipts of New England roads have been declining seriously since July 1.

The movement of grain to Europe by way of Galveston has been temporarily suspended by reason of the insufficiency of the elevators at that port to hold all the grain that is offered. At New Orleans the elevator capacity is not yet fully taken up, and that port is getting some benefit from the blockade at Galveston.

The Interstate Commerce Commission is to hold a number of sessions in Western cities in the latter part of September. On Sept. 17 the Commissioners will be at Chicago to give a hearing on a complaint against the Lehigh Valley and others which involves rates on wheat, etc., in cargo lots from Buffalo to Philadelphia, New York and other points. The following day a complaint against the Chicago, Burlington & Quincy on alleged excessive rates on coal in car loads from Chicago and Streator, Ill., to Preston, Ia., will be heard. On Sept. 21 a complaint against the Atchison, in regard to rates on grain will come up for hearing to be adjourned for further hearing at Kansas City, on Sept. 24. At the latter city on Sept. 25, the Commissioners will hear the complaint of the Kansas Railroad Commissioners against the Atchison on alleged excessive rates on corn and carloads to Galveston, and they will be at St. Louis on Sept. 28, to hear a complaint of the Business Men's League, of St. Louis, against the St. Louis, Iron Mountain & Southern and other roads on rates in less than carload lots from St. Louis to Texas points. On Sept. 29 the Commissioners will give a hearing at Biloxi, Miss.

The Seaboard Air Line announced on Sept. 3 reductions in freight rates from Baltimore to points on its railroad, but only to about one-fourth of the number of points named in the low tariff issued in July, which was withdrawn by order of the court. The amount of the reduction is from 25 to 40 per cent. Passenger rates were also reduced, but not in such a large degree as before; reports differ as to the amount of the reduction. The Southern Railway and the Atlantic Coast Line, acting with the approval of the Southern States Freight Association immediately followed with freight tariffs announcing reduction of about 33 per cent. to Atlanta and other competing points but it is said that these low rates are not made to apply to intermediate points, and therefore are in violation of the fourth section of the Interstate Commerce Law. It was said that the Seaboard Air Line people would apply for an injunction to restrain the Southern and its allies from putting these rates into effect, but we have not heard that proceedings were actually taken. At a meeting of the Executive Board of the Southern States Freight Association, held in New York, Commissioner Haines was authorized to take such further action as might be necessary with reference to further reductions by the Seaboard Air Line. The North Carolina Railroad Commission on Tuesday issued an order to the Seaboard Air Line, Southern Railway, Atlantic Coast Line and Cape Fear & Yadkin Valley roads, stating that as rates have been reduced to certain competitive points, it is ordered that all roads doing business within the State of South Carolina shall reduce their local tariffs of passenger and freight in the same proportion as has been done by them on their through business.

Chicago Traffic Matters.

CHICAGO, Sept. 9, 1896.

The movement to the G. A. R. encampment at St. Paul was far ahead of all expectations, but none of the roads were swamped. Various estimates are given of the number of people carried. As near as can be estimated the movement was divided about as follows: Milwaukee & St. Paul, 21,000 into St. Paul, of which 2,500 came from and via Chicago; Chicago Great Western, 5,000, of which 4,000 came via Chicago; Northwestern, 5,000 into St. Paul, 3,000 coming from this city; Burlington, 2,500 via Chicago, 800 via Peoria and 200 from St. Louis; Wisconsin Central 400, and the Rock Island 300. The joint agent at St. Paul was unable to stamp more than one-fifth of the return tickets. The unstamped tickets were accepted by both Eastern and Western roads. The tickets were quite extensively scalped on account of this joint agency failure.

The Lake Michigan and Lake Superior Transportation Company has reduced the lake and rail rates from Chicago to the Northwest to a basis of 10 cents first class. By a tariff put in by this company Sept. 3, the following are made from this city to points west of Duluth, and points on the Northern Pacific west of Walbridge, Wis.:

Class	2	2	3	4	5	A	B	C
Rate	$0.10	.09	.08	.06	.04	.06	.04	.04

All-rail grain shippers of this city are disappointed at the action of the Board of Managers in ordering the Chicago-New York grain rate advanced to 20 cents Sept. 15. It is claimed that this will force the bulk of the corn shipments to the Southern ports, where a great portion of it is now commencing to go. It is claimed that it will take a 10-cent rate to move grain to the East via Chicago after the close of lake navigation.

The passenger rate situation in Central Passenger Committee territory has been very bad for the past 10 days. A representative of the committee has been investigating the markets in Cincinnati, Indianapolis and Louisville, and reports that the scalpers in each city had large stocks of return tickets to New York issued on account of the Democratic convention at Indianapolis. The matter was taken up at the recent Central Passenger Committee meeting in this city. It is believed that the market is now cleared of these tickets.

The Santa Fe has again lowered its grain rates from Kansas points generally to the Mississppi River, and to Chicago to meet those recently put in by the Missouri Pacific to St. Louis, the differential between the two cities being preserved.

All competing roads have reduced the rate on grapes from Chicago to the Missouri River from 45 cents per 100 lbs, to 27 cents. The Burlington first reduced the rate and it was met by the other lines.

The Michigan Central has notified all ticket agents on on its Canada Southern Division to accept United States money at par, making no discount.

The total receipts of live stock at the Union Stock Yards, Chicago, for the month of August increased 2,123 cars, but the shipments decreased 157 cars. The receipts were proportioned among the Western roads as follows:

RECEIPTS.

Roads.	1896.	1895.
Santa Fe	1,125	1,040
Chicago & Alton	1,436	861
Burlington	6,475	5,203
Milwaukee & St. Paul	2,789	3,433
Chicago & Northwestern	4,055	3,842
Chicago, Rock Island & Pacific	2,198	1,298
Chicago Great Western	821	482
Illinois Central	1,094	1,146
Wabash	844	956
Wisconsin Central	317	143
Other lines	684	1,311
Totals	21,838	19,715

The shipments to the East were proportioned as follows:

SHIPMENTS.

Roads.	1896.	1895.
Baltimore & Ohio	258	133
Erie	1,188	737
Chicago & Grand Trunk	1,298	1,396
Lake Shore & Michigan South	744	437
Michigan Central	686	821
New York, Chicago & St. Louis	203	104
Pittsburgh, Cincinnati, Chicago & St. Louis	18	21
Pittsburgh, Ft. Wayne & Chicago	772	640
Other lines	721	1,556
Totals	5,888	6,045

Total shipments East via lake last week were 130,730 tons. All-rail shipments amounted to 61,995 tons, compared with 63,179 tons for preceding week and 57,232 tons for the corresponding week of last year. The all-rail traffic was carried in the following proportions:

Roads.	WEEK TO SEPT. 5.		WEEK TO AUG. 29.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	7,382	11.2	7,373	11 7
Wabash	6,698	10.8	6,381	10.1
L. S. & M. S	8,338	13.7	7,226	11.4
Pitts., Ft. Wayne & Chicago	6,492	11.9	6,341	10.0
Baltimore & Ohio	6,067	9.6	6,375	10.1
Pitts., Cin., Chi. & St. Louis	5,883	8.6	6,835	10.8
Grand Trunk	6,285	10.3	5,733	9.1
N. Y. C. & St. L	6,222	10.8	6,017	9.5
Erie	5,596	8.5	7,382	11.7
C., C., C. & St. Louis	3,032	4.6	3,516	5.6
Totals	61 995	100.0	63 179	100.0

Of the above shipments 2,476 tons were flour, 24,739 tons grain, 14,884 tons provisions, 9,929 tons dressed beef, 2,041 tons butter, 1,511 tons hides and 3,050 tons lumber.